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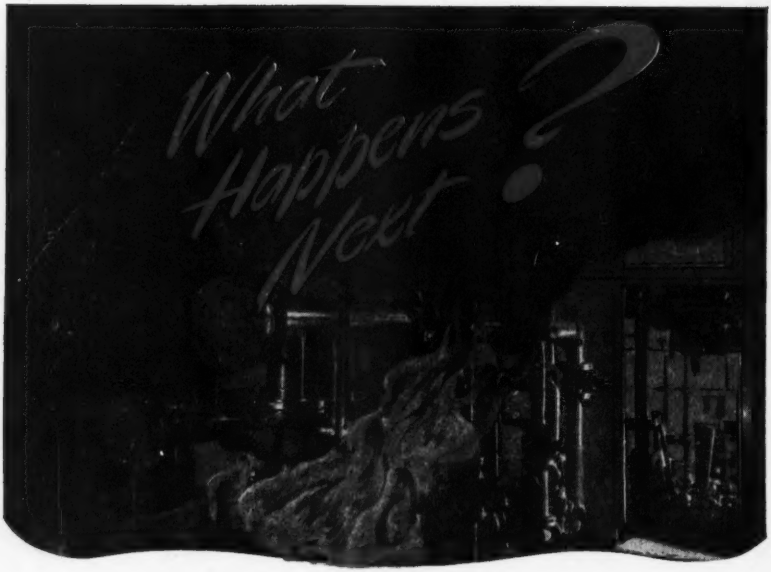

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of the

NATIONAL FIRE PROTECTION ASSOCIATION

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Accounts of fires appearing in the Quarterly are copies of or extracts from reports forwarded to the Association. This Association, as a body, is not responsible for the statements or opinions of any of its members.

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The Winecoff Hotel at 9 a.m. after the fire. The "fireproof" building successfully met the conditions for which it was designed, complete burnout of contents without structural collapse. (See page 141.)

The Quarterly

Vol. 40 January, 1947 No. 3

Fire Protection Developments in 1946.

By Percy Bugbee, General Manager,
National Fire Protection Association.

The rising trend of fire losses of recent years continued at an accelerated rate in 1946. The preliminary estimate of the loss for the year is $561,000,000. This compares with the preliminary estimate of loss of 1945 of $455,000,000. There were 187 fires reported during 1946 with a loss in excess of $250,000. Here again the figure is substantially higher than in previous years.

Life Safety.

The year was marked by three hotel fires involving substantial loss of life—the Hotel Winecoff fire in Atlanta in December in which 119 persons were burned to death, the Hotel LaSalle fire in Chicago in June in which 61 persons were killed, and the Canfield Hotel fire in Dubuque a week later in which 19 died. Following the Cocoanut Grove night club fire in Boston in 1942, a great amount of special legislation, inspection procedure and other action was taken to make night clubs throughout the country safer from fires. Similarly, after the Hartford circus fire in July 1944 action was taken to prevent circus fires. Following these three disastrous hotel fires, intense activity is being and will be taken to make our hotels safer. If real results are to be accomplished, the real lesson of all fire disasters must reach the public consciousness and steps must be taken to prevent fire and panic in all places where numbers of people live or congregate. The principles of life safety such as those set down in the National Fire Protection Association Building Exits Code must be made to apply to all places of public assembly if we are to stop wholesale deaths by fire. A serious loss of life from fire may well occur at any time in certain department store basements or churches or college dormitories. The measures to protect all such places should be taken before the disaster and not after. Inadequate exits or locked or obstructed exits, lack of automatic detection systems or automatic sprinklers where obviously necessary, flammable decorations and promiscuous smoking in hazardous areas and other obvious factors, can and should all be taken care of in all places of public assembly before and not after fire strikes. An aroused and intelligent public opinion is what is needed to see that all such places are really made safe for the men, women and children who flock to them, trusting to someone always to have made sure that at least they have a reasonable chance to get out alive if an outbreak of fire occurs. Legis-

lation is by no means the only answer. Intelligent inspection and enforcement by adequately manned municipal building and fire departments, backed up by public opinion, are important and necessary. In most places the broad police power gives the enforcing authorities the right to correct or close up an existing building that endangers life, but the enforcing authority is helpless if he does not have public support.

It is impossible in this short article to discuss all of the factors that are operating to bring about the serious increase in fire losses since the close of the war. A similar period of rising losses followed the first World War. In wartime, substandard construction is encouraged. In the reconversion period following a war there is an inevitable letdown of maintenance, inspection forces of fire departments and other agencies are depleted, fire protection equipment is hard to get. All of these things tend to increase the fire loss.

Fire Department Advancements.

Perhaps the most striking development during the past year in fire department operations has been the widespread and growing tendency to shorten the working hours of firemen. It appears that this trend will continue very substantially throughout the coming year. Unfortunately in all too many cases the voters have no knowledge of the extra expense incurred and the municipal officials in many cases do not realize the many difficulties that they will face in a radical change in the working hours and a heavy increase in personnel in the fire departments. There is no reason why an increase in operation efficiency should not be expected if a shorter work week for firemen is put into effect. Inspection work should be stepped up materially. Certainly fireman training becomes more important than ever with large additions of new men.

While some progress has been made during the past year in rebuilding the fire prevention inspection forces and procedures of many municipal fire departments, this very necessary function has been slow to return to prewar standards and in all too many cities fire prevention inspection procedure still seems to be a stepchild of the fire department operation rather than a most essential and effective part of the fire department program.

Fire departments throughout the country have shown great interest in the past year in the use of water spray or fog as a means of extinguishing fires and also in the installation of two-way radio.

Municipal Codes.

Throughout the war years there was little progress made in building codes and fire prevention codes in cities, but during the past year a substantial amount of interest and development has taken place and many cities are revising their codes. We expressed the fear a year ago that building codes and other construction standards would be broken down substantially because of the terrific pressure for additional housing. While this has happened in some cases, it has not been as widespread as we had feared. The conversion of many large old homes to rooming houses has brought serious life hazards and has been a matter of concern to most city building inspectors and fire chiefs. It is not doing much of a favor to the returning veteran to house him and his family in a fire trap.

Milwaukee adopted a very interesting ordinance in 1946 providing for a fine

or jail sentence for any person who through careless smoking set fire to a building. It was provided that the new ordinance must be plainly posted in each sleeping room of all hotels, rooming houses, lodging houses and other places of public abode.

The long-awaited new edition of the National Electrical Code made its appearance in November 1946. This Code is widely used by states and cities throughout the country and is, therefore, of real importance to municipal officials.

Another interesting legislative development of the year was a decision of the Supreme Court of Texas which upheld the reasonableness of the adoption by reference of the Liquefied Petroleum Gas Standards of the National Fire Protection Association. The adoption of good fire protection standards by reference has long been needed by many communities.

Public Education.

A favorable factor in the overall picture has been the steadily growing movement to educate the public in at least the fundamentals of fire safety. The Spring Clean-up Campaign and Fire Prevention Week in October were both more widely observed in 1946 than in any previous year in history. An important accomplishment was the issuance by the United States Office of Education of a Curriculum Guide to Fire Safety for Elementary Schools. Fire prevention education has always had good support from the newspapers and from the general and trade magazines and now has a new ally in radio. Nearly all of the radio stations in the country have cooperated during the past year in the fire prevention campaign and many of them have provided new and effective material.

The past year was a very important one in the history of the National Fire Protection Association as the Association observed its 50th anniversary. During the year the Association created new Committees on Fire Gas Research, Fire Prevention Education for Elementary Schools, and Magnesium, and reorganized its Aviation Committee. The year was marked by a continued expansion in the Association's membership and particularly in foreign countries, and the Association issued more publications than in any year in its history. During 1946 the Association received a certificate of achievement from the United States Navy for its war services to the Navy and to the public and also received an award of merit from the American Trade Association Executives for its contributions throughout the war.

The Hotel Winecoff Disaster.

By James K. McElroy,
N.F.P.A. Engineer.

St. John 8.7
So when they continued asking him, he lifted up himself, and said unto them, He that is without sin among you, let him first cast a stone.

The loss of 119 lives and the injury of 90 persons as the result of fire in the Hotel Winecoff in the early morning hours of December 7, 1946, is essentially the effect of over-confidence in a type of structure for a great many years commonly and erroneously described as "fireproof" by many engineers and believed to be so by the public.

The shock of the Winecoff disaster, while greatest to the loved ones of the dead and injured and the hotel management, was no less a shock to architects and engineers who have designed, built and periodically inspected the Hotel Winecoff and other so-called "fireproof" buildings. In this case there were clues to the impending disaster in the record of the Hotel LaSalle fire in June, 1946, which also involved unprotected vertical openings, delayed detection of fire and delayed alarm to the fire department.

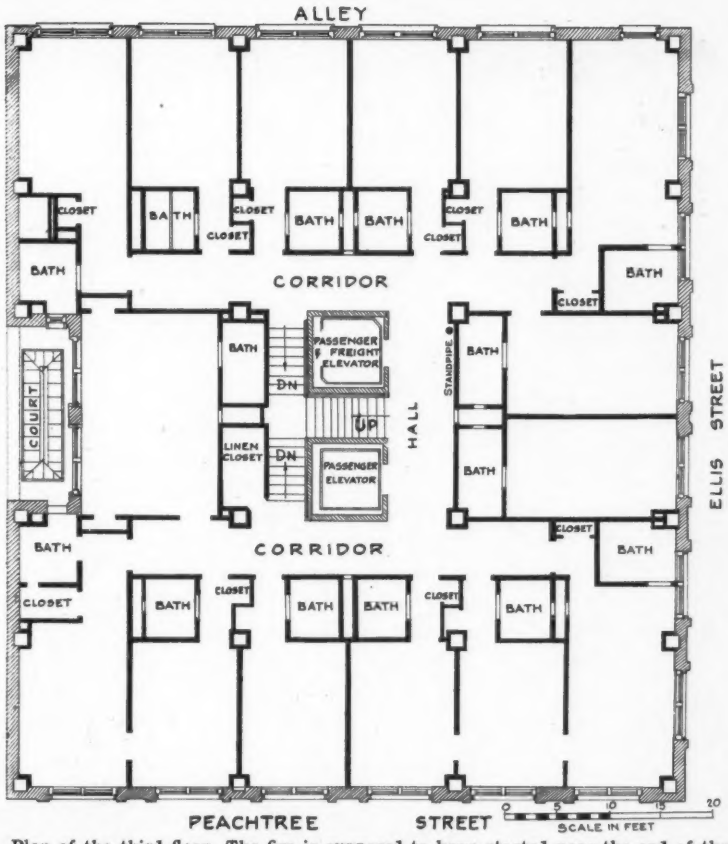
The screams of the Winecoff's occupants and the dull thud of bodies hurtling to Peachtree and Ellis streets should eliminate for all time the illusion that this and other buildings, classified as "fireproof" in fire insurance rating schedules and many building codes, are secure against all perils to life safety without adequate safeguards for combustible interior finish and contents.

The lessons to be found in the ruins of the Hotel Winecoff are the focal point of international attention by hotel owners and managers, architects and builders, building and fire department officials, fire prevention and casualty engineers; fire, casualty, and life insurance companies; manufacturers of fire protection equipment; legal authorities and the public, immediately concerned with the prevention of loss of life from fire causes throughout the world.

The Building.

Mr. Marvin Harper, for the past year Chief Building Inspector for the Atlanta Departments of Buildings, stated following his careful examination of the structure after the fire on December 7 that the building did not deviate in any major respect from the requirements of the 1911 Atlanta Building Code. Except for minor improvements too slight to require compliance with the provisions of a new building code, adopted on December 7, 1923, and subsequently amended by ordinance, the building at the time of the fire was essentially in the same condition structurally as it was on the day it hospitably opened its doors in 1913.

A building permit was issued in 1912 by the then City of Atlanta building inspector for the erection of the 15-story, basement and sub-basement, protected steel-framed structure, to be built on a lot 62 ft. 9 in. by 70 ft., or 4,386 sq. ft. Under the provisions of Sections 65, 68 and 89 of the 1911 Building Code with the lot size *less than 5,000 sq. ft., no protection*



Plan of the third floor. The fire is supposed to have started near the end of the corridor, upper left in this plan, although the exact origin may never be known. The arrangement was the same on all floors above.

was required for the *single stairway* which was the *only means* of *egress* from upper floors of the building, except the windows.

Except for minor variations, the 4,386-sq. ft. floor plan (see below), was typi-

Applicable excerpts from 1911 Atlanta Building Code.

Section 65. In any building hereafter erected to be used as an office building, store, factory, hotel, lodging house, or school, covering a lot area——

Exceeding five thousand feet and not exceeding six thousand five hundred feet, there shall be provided at least two continuous lines of stairs remote from each other;

And every such building shall have at least one continuous line of stairs for each six thousand five hundred feet of lot area covered, or part thereof, in excess of that required for six thousand five hundred feet of area.

(Section 65 further provides that there shall be not less than three feet six inches in the clear between hand rails of the stairs.)

Section 68. No opening in any floor or roof shall be without a solid covering or enclosure as provided in this code, to prevent the communication of fire from story to story, except as otherwise provided in this Code for certain stair case openings which are not required to be inclosed.

Section 89. Any hotel building having an area requiring more than one stairway as provided in Section 65 of this Code, shall have at least one continuous stairway inclosed in the manner described in this Section.

Press Association.

View of the fire taken from the corner of Peachtree and Ellis Streets about 5 a.m. By this time all of the lives had been lost.

cal throughout all floors above the second. There are fifteen rooms per floor, approximately 530 sq. ft. of hall and corridor space, a small service closet, and space for the two enclosed elevators and the unprotected stairway. It will be noted that the corridors and hall do not extend to the exterior of the building on any floor.

The incombustible stairway is typical throughout all upper floors except for a direct stairway from the uppermost floor to the roof. The arrangement of the stairway must be understood to provide the only plausible explanation for the fact that the fire, believed certain to have originated in the third floor corridor, did not swiftly reach the top floor and mushroom at that level. It will be noted from the floor plan on page 142 that the entrance to the stairway is between the two passenger elevators on each floor. There are 10 stair treads to the landing, from which the stairway divides to the right and left behind the elevator shafts and in seven stair treads reaches the floor above. There is approximately 800 cu. ft. in volume in the stairway space at each floor. This unusual arrangement acted as a temporary check to the passage of hot gases and the spread of fire from floor to floor, but was insufficient by itself to prevent the nearly total destruction of all combustible material from the sixth to the twelfth floors at the time of the fire.

There were other vertical openings in addition to the unprotected single stairway, though none contributed to the spread of fire in the building. The two passenger elevators were enclosed in masonry shafts, with wired glass panels in metal doors. Though the wood doors in the corridors to the pipe shafts burned off, there was no spread of fire throughout the building attributable to this condition.

Left — looking up the open stairway between the two elevator doors. Right — looking down the stairway from the floor above. The stairway branched at the landing, as shown in the plans.

Typical interior of a room showing character of damage. The window in this picture is wired glass designed to provide protection against exposure from the adjoining mercantile buildings.

Each service closet had a protected opening to the sheet-metal laundry chute. Wood backing for the mail chute burned out on several floors, but there was no indication of spread of fire at the point of passage through the floor construction.

Structurally, the fire resistance provided for the steel-framed building was sufficient to resist, without collapse, the fire which required the heroic efforts of the Atlanta Fire Department for three hours before it was brought under control. Except for metal sash and wired glass windows in the south wall of the building, all the window frames and sash in the masonry exterior walls were wood.

Floor construction throughout the upper floors of the building is concrete and tile. Floors, except the *single stairway,* were covered completely with rugs, which did not contribute to the spread of fire throughout the building until other combustible materials in the rooms and corridors were completely involved.

Room and corridor partitions were plastered 3-in. hollow clay tile throughout the building. Partitions in the corridors and the hall were decorated with an unobtrusive painted burlap to wainscot height. Rooms throughout were finished with wallpaper, in some rooms seven layers in thickness. During the past two or three months the corridors and halls were redecorated with an oil base paint, thinned with mineral spirits, reported to have been thoroughly dry at the time of the fire.

Of major importance in the spread of fire were wood doors and transoms used

throughout the building. Corridor doors were 1¾ in. in thickness, with ½-in. plywood panels and mirrors on the room side of each door. Wood-framed transoms had wood panels 5/16 in. in thickness. Baseboards, trim, wainscot molding and access doors to pipe shafts were all wood. In the light of events, it can be said that the amount of combustible material surface in the halls and corridors was comparatively high in proportion to the approximately 4,700 cu. ft. of volume of the hall and corridors per floor. Interior woodwork was highly finished.

Furniture throughout the hotel was combustible for the most part. Several rooms with metal bedsteads burned out, leaving the twisted metal debris behind. It is reported that the hotel management had made a practice of flameproofing mattresses and pillows, though this treatment was of no avail when other combustible material became totally involved.

Special hazards did not in any way contribute to the spread of fire or loss of life. Refrigeration equipment, paint storage and maintenance shops were located in the basement and sub-basement. The hotel kitchens on the first and mezzanine floors were relatively undamaged by fire. The

Remains of the mattress in the end of the third floor corridor where the fire may have started.

valet shop was in the penthouse.

In general, appearances following the fire indicated that the Hotel Winecoff was in good condition at the time of the fire. There were no indications of poor housekeeping or lack of maintenance. The chief engineer, among other qualifications, had experience in the installation of automatic sprinkler systems. In 1942 fires occurred in guest rooms of the hotel and were successfully confined to the rooms of origin by hotel employees and the Atlanta Fire Department, and thus contributed to the general over-confidence in the structure.

Fire Protection Facilities.

Private fire protection equipment included a 4-in. standpipe, with siamese connection at the sidewalk level in Ellis Street. Two and one-half-inch hose was provided at each floor, and it is fortunate that hose connections to the standpipe were changed during the past year to fit the standard thread of the fire department. The standpipe was supplied from a 5,000-gal. tank on the roof, with 92 lb. normal pressure maintained. Static pressure on the city mains in this location is normally 43 lbs. with an adequate supply. One 2½-gal. soda and acid extinguisher was provided in each elevator hall.

The night engineer doubled as the watchman and was expected to make two-hour rounds, without clock. The time stamp at the registration desk in the lobby was used to register the start of each tour. On the night of the fire the following employees were on duty:

Night Manager	Elevator Operator
Night Engineer	(female)
Telephone Operator	Room Maid
Night Manager's Wife	Room Cleaning
Bell Boy	Woman

The N.B.F.U. grading schedule was used in 1933 to classify Atlanta as having Grade 3 fire protection. The National Board of Fire Underwriters bulletin reported on the changes in fire protection facilities for the City of Atlanta on June 24, 1946. Two engine and two ladder companies are located within two blocks of the Hotel Winecoff, one station is thirty seconds running time from the building, and both stations responded on the first alarm at this location.

Cause and Origin.

The cause of the fire has not yet been determined. Its origin is believed certain to have been in the west corridor of the third floor, though the exact point of origin may never be known. One guest room off the west corridor was taken over for office space the day before the fire and the bedroom furniture, including bedstead, bed spring, mattress, and a chair, had been temporarily placed in the corridor. Following extinguishment of the fire, the partially burned mattress, painted burlap wainscot, wood baseboards and molding were found as shown in the photograph on page 8. At a point nearer the west elevator shaft the baseboard, painted burlap wainscot and the wood molding were entirely consumed, giving plausibility to the belief that the point of origin may have been nearer the stairway opening to the fourth floor, particularly in view of the high degree of combustibility in the remaining unconsumed portion of the mattress.

Delayed Discovery and Alarm.

Official records of the Atlanta Fire Department show that a telephone call at 3:42 A.M. was the first and only notification to the department that there was a fire at the Winecoff. The night manager is reported to have given the telephone alarm. Events preceding the alarm to the fire department are obscure though credence is given to statements made by the bell boy and the night engineer, which

place the time of discovery at 3:15 A.M. It was the custom to require a time stamp at the desk in the lobby for all room service orders. The bell boy is reported to have received a call for service from room 510. Upon answering the call he stated that he time-stamped the service slip at 3:10 A.M. and went to the fifth floor, leaving his master keys and the slip on the stool in the elevator, which was left at that floor with the door blocked open. After the fire the elevator and the master keys were found as the bell boy had reported he left them. The bell boy and the occupant of room 510 were trapped in their room when, five minutes later, upon opening the door to the corridor, it was found that the corridor was full of heat and smoke. Both were rescued 45 minutes later through the outside window. Inquiries which have been in progress since the fire may disclose exactly what transpired between 3:15 A.M. and 3:42 A.M., but the delay in discovery was disastrous.

A portion of the burlap on a corridor wall on the 12th story. This burlap, impregnated with successive coats of paint, was completely consumed by the fire on most floors.

It is reported that the night manager attempted to warn the occupants of the guest rooms of the danger by house telephones, though the cramped halls and corridors on each floor were rapidly untenable and as there was but the SINGLE STAIRWAY FOR EGRESS from the upper floors the position was hopeless for the occupants except for the possibility of rescue through the exterior windows. In this case had a manual alarm been provided to arouse the guests and had it been used to send them into the confined corridor with its single stairway almost certain death by asphyxiation would have been the result. The roof was the safest place in the structure above the fire. Persons on the upper floors specifically warned to escape to the roof in time, probably could have reached that location safely.

Spread of Fire and Loss of Life.

On the arrival of the first engine and ladder company, thirty seconds after the receipt of the telephone alarm, guests were jumping from the windows of the upper floors. One body fell at the feet of the fireman setting the ladder jack under the first aerial ladder to arrive on the scene. Many guests were seen attempting to descend by knotted bed sheets. Several successfully reached the fire department ladders raised to their maximum elevation.

Three hundred and four guests were

Rescue operations were conducted, using a short ladder as a bridge across the 10 ft. alley between the hotel (left) and the Mortgage Guaranty Office building (right).

registered in the hotel on the night of the fire. One hundred and nineteen died and some sixty-five guests were injured. About 120 escaped uninjured. Fire department ladders raised from the street accounted for many rescues from the lower floors. Some rescues were also effected by short ladders used as bridges across the alley. A number were saved by jumping into nets although with several people jumping simultaneously to the same net only one could be caught. As in other fire tragedies, many persons lost their lives by jumping who might have been rescued had they remained in the building a few minutes longer.

The fire department, devoting its first attention to saving life, did all that could reasonably be expected under the circumstances. Their operations were limited by the available manpower and equipment and by the fact that most of the windows on the upper floors were inaccessible. Below the top two floors, which escaped the most serious burning, keeping doors and transoms closed served only to delay death. Apparently no one on these floors survived except those rescued by the fire department.

The fire spread from floor to floor through the unenclosed stairway by ignition of the combustible interior finish in the corridors and halls, aided by the draft produced through open wood transoms over the wood doors to those guest rooms in which the exterior windows had been thrown open to await rescue or to obtain air to maintain life.

Wood doors and transoms were burned away on all floors from the fourth to the thirteenth, with almost total destruction of all combustible material from the sixth to

the twelfth floors. There was little physical damage except from the heat and smoke on the fourteenth and fifteenth floors (believed due to the fact that the fire was gradually venting itself through the exterior windows of lower floors), though loss of life did occur on both floors, in one instance due to open windows.

As in the Hotel LaSalle fire, there were rooms totally burned out with transoms open, and others only slightly damaged where the transoms were closed.

Extinguishment.

The Atlanta Fire Department, consisting of approximately 385 men and officers under Chief C. C. Styron, mans twenty-two engine companies (most of of which are equipped with 1,000-gal. pumpers), eleven ladder companies and a squad company. Of five aerial ladders one was out of service at the time of the fire. In all, forty-nine pieces of fire apparatus were in service at the Winecoff. Mutual aid agreements were responsible for assistance from Avondale, College Park, Conley Motor Base, Decatur, Druid Hall, East Point, Ft. McPherson, Hapeville, Marietta and the Naval Air Base.

First alarm response in the Winecoff area consisted of four pumpers, two ladder trucks, and one squad car carrying rescue equipment.

Several firemen were injured by falling bodies during rescue operations with ladders and nets.

The first engine company on the scene laid their lines into the lobby and up the stairway. As additional equipment arrived and was placed in service the fire was fought simultaneously from the interior, from the street, from the roof of a 12-story office building across a 10-ft. alley, and from the roof of a 6-story department store across Ellis Street (58 ft. wide). Fire department pumpers supplied the standpipes in the Winecoff, the office building and department store, from which lines were used to combat the fire, finally brought under control in about three hours as firemen battled their way floor by floor up the SINGLE STAIRWAY in the center of the building, using fire department hose to replace the hotel hose burned from the standpipe connections. It was a rugged, nasty job in confined space and dense smoke and in the face of cascades of hot water pouring down the stairway. Several firemen were overcome and carried to the street for resuscitation. Delayed discovery and delayed alarm to the fire department produced a situation which the fire department could not be expected to overcome without heavy loss of life.

Other Contributing Factors.

There are many additional factors, other than hazards inherent in the structure from the moment the plans left the drafting board, which contributed to the eventual loss of life in the Hotel Winecoff. Some were within the control of the owners and managers, others were not, as they could not be expected to have fire prevention and protection experience. The accurate determination of some of the additional contributing factors is impossible due to the passage of time and the death of individuals who alone could supply the necessary information.

The original owner and his wife died in their tenth floor apartment during the Winecoff fire. The architect had passed away at some earlier time. It would be useful to learn from them the considerations which had prompted the erection of a hotel on the small area site. The building exit requirements of the 1911 building code permitted economies in building

Press Association.

When the fire department raised their first aerial ladder, people were awaiting rescue at windows and many were already jumping. This picture shows improvised bed sheet ropes which were used successfully in some instances to descend from windows above the reach of the 85 ft. ladder. Many of those seen in the windows of this picture, beyond the reach of the fire department, could not be rescued.

exit costs and therefore additional rental return from guest rooms in the hotel where space limited the number of rooms to fifteen per floor. At an estimated $2.00 per night gross return for one room on each floor needed to provide a second means of egress, over $300,000 in gross return over thirty-three years was available to the owners. The death of the principals also makes it impossible to learn whether or not the fire insurance rating organization which had jurisdiction was consulted by the architect to determine, in advance of design and construction, the additional fire insurance costs to be charged throughout the life of the building because of the proposed lack of protection for the single unprotected vertical stairway opening. Perhaps the *usual* choice was made by the owner that he would pay the additional costs in fire insurance premiums in lieu of protecting the opening, though had he elected otherwise, the loss of life which occurred in 1946 would almost certainly have been minimized, and the fire confined to the floor of origin, regardless of

the provisions of the Atlanta building codes. In any event, the owners of the hotel paid the deficiency insurance charges for the unprotected stairway through all the years, no doubt over-confident in the structure, as they advertised it as "Absolutely Fireproof"!

It would also be useful to report whether or not the owners of the Hotel Winecoff had ever been approached by the manufacturers and distributors of automatic sprinkler and automatic fire detection equipment. Following the fire, none was discovered who had done so, though automatic sprinkler protection in the corridors alone would have detected and extinguished the fire. In view of the thirty seconds running time from the nearest fire department engine house, automatic fire detection equipment could be expected to have avoided disastrous delayed discovery and brought prompt response by the fire department. The clue to the advantages of partial automatic protection for halls, corridors and hazardous areas in fire-resistive hotels was found in the history of the Hotel LaSalle fire, but thus far no one has been found who carried the story to the owners of the Winecoff.

Almost immediately after the Winecoff fire there was the usual public demand that the provisions of the latest edition of the Atlanta Building Code, which require at least two means of egress and enclosure protection for vertical openings be enforced. The usual statements as to the unconstitutionality of retroactive provisions regarding existing structures of all building codes followed. If the point of view is accepted that retroactive provisions of building codes *can* be enforced, the fact remains that no legal action was taken against the owners of the Winecoff since the adoption of the new building code by the General Council of Atlanta in 1923, which was the first opportunity provided to correct the inherent hazard in the exit facilities at the Winecoff, which were constructed in accordance with the provisions of the 1911 building code. To have legal responsibility but insufficient staff to discharge the responsibility is not confined to the Department of Building of the City of Atlanta. At the time of the fire, Chief Inspector Harper's staff consisted of himself and five others, including stenographic help. Aside from other places of public assembly, there are approximately eighty hotels in the city of Atlanta, all of which present specific life-safety engineering problems for solution by owners and building officials.

Similar considerations of the legal aspects of enforcement of the retroactive provisions of building code requirements had occurred in Atlanta prior to the Winecoff disaster. Following the loss of thirty-five lives from fire in the 5-story, brick and wood-joisted Terminal Hotel in Atlanta early in the morning of May 16, 1938, a solution was sought for those situations in which the public believed there was "no legal recourse" to obtain correction of hazardous conditions. Mr. J. C. Savage, then, as now, City Attorney of Atlanta, stated at that time that he differed with those who were under the impression that all that was needed to make hotels and other places of public assembly safe was "more law." He cited Title 72 of the Code of Georgia of 1933, Section 72-102 as follows:

> Private citizens may not generally interfere to have a public nuisance enjoined, but the petition must proceed for the public on information filed by the solicitor general of the circuit. A public nuisance may be abated on the application of any citizen specially injured.

Mr. Savage further stated on June 29, 1946, following the Hotel LaSalle fire that, "All of Sections 72, 73 and 74 of the

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By the time this picture was taken, further rescues from the upper floors were impossible.

Code of Georgia of 1933 are devoted to nuisances and their abatement and vest the power of the State to be exercised through the Solicitor General wherever it is a public rather than a private nuisance."

Again quoting Mr. Savage, "After the Terminal Hotel fire we closely scrutinized the City Ordinances with reference to nuisances and their abatement. We found them to be somewhat inadequate and outmoded. We felt that we could simplify their enforcement and at the same time broaden their scope. Thereupon we prepared a complete new nuisance law for the City of Atlanta, which law was adopted June 10, 1938. A great deal of study by the entire Law Department was put into this ordinance and we think it is good beyond all question. If any officer of the City of Atlanta presents to the Law Department sufficient evidence to sustain a case of public nuisance or a fire hazard we will prosecute to the fullest extent of our ability regardless of who might be involved."

In view of its possible usefulness to enforcement officials interested, the following quotation from the Code of the City of Atlanta of 1942 is provided:

CHAPTER 65—Code of the City of Atlanta of 1942—Sec. 65-102.

651102. ABATEMENT OF NUISANCES IN OR AROUND BUILDINGS.

1. CONDITIONS CONSTITUTING NUISANCE.—Any building, structure, enclosure, place or premises is a nuisance, where it is perilous to life or property by reason of its construction, or of the condition or quantity of its contents, or of the use of the building or its contents or the enclosure, or of the overcrowding at any time of persons therein, or of deficiencies in its fire alarm or fire prevention equipment, or of conditions in its construction likely to cause fire or the spreading of fire, or of conditions therein which would hamper or impede the Fire Department in combating a fire in or about the building, or where the condition of the walls, floors or roof is such that the building is likely to fall on account thereof, thereby endangering the safety of its occupants or of the public.

2. DUTY OF BUILDING INSPECTOR, WITH CHIEF OF FIRE DEPARTMENT, TO ENFORCE SECTION.—The Building Inspector, acting in cooperation with the Chief of the Fire Department, is charged with the duty of enforcing this section.

3. PROCEDURE ON ABATEMENT.—Whenever the Building Inspector has information that any building is alleged to be a nuisance within the provisions of this section, he shall cause an examination thereof to be made. If in his opinion, after such examination, such building constitutes a nuisance within the provisions of this section, said Inspector shall serve notice upon the owner of such building, or the person in possession, charge or control thereof, directing him to abate the nuisance, if the same is abatable, and specifying the defects or things to be corrected to place the building in a safe condition; and if conditions be such that the defects or things cannot be corrected or abated, requiring him to demolish such building. Such notice shall provide and name a reasonable time within which such nuisance shall be abated or the building demolished. Upon the failure of the person notified to obey such notice, the Building Inspector shall, after the expiration of the time specified in the notice, cause a summons to be issued to such person, requiring him to show cause before the Recorder, at a time and place named therein why such nuisance should not be abated or, in event the alleged nuisance cannot be abated, why the said building should not be demolished. If upon a hearing of the case, the Recorder determines that such building cannot be repaired or

put in a safe condition, he shall render a judgment that the building be demolished by the defendant within a specified number of days and that, upon failure of defendant to demolish it, then the same shall be done by the City of Atlanta at the expense of the defendant. In the event that the Recorder upon such hearing shall find that the building constitutes a nuisance, but that the nuisance can be abated by the doing of certain things to said building, such as repairs, changes or alterations, the Recorder shall provide in his judgment how and in what manner such nuisance may be abated and shall designate the time within which such acts must be begun. In such case, the judgment shall further provide that if the defendant fails to begin compliance with said judgment within the time specified, notices shall be placed at the entrances of the building, stating that the premises therein have been declared to be a nuisance and unsafe, and that the entrances to said premises upon the sidewalk or street shall be blocked off by barriers or guardrails. In the event of an appeal being taken from the judgment, pending such appeal the Building Inspector shall cause to be erected on the street or sidewalk adjacent to the entrances of the building, signs stating that such building has been declared to be dangerous and unsafe. (June 10, 1938.)

It will be noted that Chapter 65 of the Code of the City of Atlanta vests the authority for the abatement of nuisances in the Building Inspector acting in cooperation with the Chief of the Fire Department. The shortage of manpower in the Chief Building Inspector's office has been previously discussed. Chief Styron and Fire Marshal Phillips were similarly handicapped. At the time of the fire at the Winecoff, the Bureau of Fire Prevention staff provided for enforcement of the Fire Prevention Ordinance adopted by the General Council on August 4, 1941, consisted of seven uniformed officers and men, one on military leave. Chief Styron's secretary is the only clerical assistance available to Fire Marshal Phillips. Under the Fire Prevention Ordinance, Chief Styron is also responsible for the issuance of permits for the use of explosives, pyrotechnics, nitrocellulose motion picture film, pyroxylin plastics, compressed and liquefied gases, flammable liquids, etc. Whatever the legal provisions made for the enforcement of building code requirements and the abatement of nuisances, it is difficult to avoid consideration of the effect on the loss of life in the Winecoff disaster had the Building Inspector's office and the Fire Prevention Bureau not been undermanned.

Lessons.

The lessons which are available in the loss of life in the so-called "fireproof" Hotel Winecoff will be of no use whatever unless their full import effectively reaches hotel owners and managers whose basic responsibility for life safety in their structures cannot be morally or legally avoided. Public condemnation of hotel managements or the use of legal force will not be required in the vast majority of cases if hotel managements are convinced that conditions needing improvement can be demonstrated from the record to be necessary and reasonable. Hotel owners and managers can do little without technical engineering advice which they must seek or which is placed at their disposal by public or private agencies.

The loss of sixty-one lives in the Hotel LaSalle fire in June, 1946 (also described as "fireproof") was the "tip-off" and the loss of 119 lives at the Winecoff furnished the "proof" that a re-examination of previously accepted practices and activities in the hotel field and the fire and casualty insurance industry is imperative if the future safety of hotel guests and employees is to be assured. Thus far it has appeared impossible to transmit through cold print, to those who should be concerned with life safety from fire the lesson quickly learned by children through their first contact with a hot stove. This latest and heaviest loss of life in a fire-resistive structure provides the necessary impetus to review the lessons.

Left — looking into the corridor from a third floor room where the transom was open during the fire. Right — similar view from a third floor room where the transom was closed, showing no fire damage. In most rooms, however, even where the transom was closed, the wood transom panels burned out.

Owners and Managers.

Owners and managers desirous of improving the safety of hotels would be well advised to consider the adequacy of their exit facilities and the presence of unprotected stairway and elevator openings. The employment of able watchmen, sufficient in number to assure patrols at not less than *20-minute* intervals would have prevented the delay in discovery of this fire (of whatever cause and origin) that eventually reached holocaust proportions. In this fire, a single fifty-dollar door installation at the entrance to the stairway from the third floor (if closed) would have prevented the spread of fire to the upper floors. More than half of the 195 transoms over the doors to guest rooms in the Winecoff were found in open position following the fire. Seven hundred and eighty six-penny nails, four to the transom, a forty-nine cent hammer and a man to use it could have closed the transoms and thus delayed the fire in the corridors from spreading rapidly into the rooms. Closed transoms would have afforded the fire department a better opportunity to extinguish the fire in the corridors which spread rapidly by the draft produced through open transoms and exterior windows. Automatic fire detection equipment, properly maintained, installed in the corridors (in rooms if the hotel management wished to protect the fool who smokes in bed) could have avoided the tragic delayed discovery altogether. Properly maintained automatic sprinkler protection for the corridors alone would have not only detected but extinguished the fire in its incipient stage. Complete automatic sprinkler protection for the entire structure would not have been necessary to prevent its collapse or total destruction.

As an indication of what may be expected of hotel owners who are convinced that life safety is paramount over all other considerations there is an example in

Atlanta following the Winecoff fire. The owner of the Hotel Ansley called Fire Marshal Phillips and asked him to witness the signing of a contract for $107,000 for the provision of complete automatic sprinkler protection throughout the building, additional exits from the roof-top night club and the enclosure of all unprotected stairway openings, all this without reference to fire insurance rate credits, legal force or other coercive action by any public or private agency. The owner of the Ansley also employed two 45-year-old retired Atlanta firemen to patrol the building and maintain the fire protection equipment. The 119 victims of the Winecoff fire will not have died in vain if other hotel owners throughout the world are convinced, as was the owner of the Hotel Ansley, that the "stove is hot."

Fire Protection Equipment.

The lesson in this fire for the manufacturers and distributors of approved automatic sprinkler and automatic fire detection equipment lies in the fact that investigation failed to disclose efforts on the part of anyone connected with the industry to convince the management of the Hotel Winecoff that installation of this equipment would prevent delayed discovery and alarm to the Atlanta Fire Department. A very few automatic protection systems were sold and installed in Atlanta hotels following the loss of thirty-five lives in the Terminal Hotel fire in 1938.

Architects and Builders.

There are four major lessons for architects and builders in this disaster:

1. It is dangerous to sacrifice life-safety features such as adequate exit facilities, protection of vertical openings, etc., for economic considerations of space return and building costs.

2. Though the steel-framed structure was found to be structurally sound following the fire, the comparatively small surface area of combustible wall finish, doors, transoms, trim, and baseboards in the confined hall and corridor space was sufficient to provide fuel for a fire of the intensity required to burn through guest room doors and totally consume all combustible material in guest rooms from the sixth to the twelfth floors, particularly in those rooms in which combustible transoms were left open. The LaSalle and Winecoff hotel fires both demonstrate the severe hazard to life in the use of transoms without automatic fire detection and prompt extinguishment of fire in the incipient stage outside the rooms.

3. Active cooperation is required of the architect and builder on behalf of their clients with building departments and fire prevention bureaus, insurance rating organizations, insurance company fire protection engineers, all of whom have access to loss-of-life records, nationally recognized standards of fire prevention and fire protection and can contribute to the future life safety of the clients, guests and employees in both new and existing buildings.

4. Automatic protection, properly installed and maintained, for corridors and especially hazardous areas, storage rooms, in a fire-resistive structure is sufficient to avoid delayed discovery of fire and confine the fire to the place of origin.

Building and Fire Department Officials.

There are several lessons apparent in the results of the fire at the Winecoff for building and fire department officials:

1. Municipal authorities who have by ordinance vested the legal responsibility for life safety in hotels and other places of public assembly in the building department and fire department officials, have the obligation to provide these departments with well-trained and qualified staffs commensurate with their responsibilities. Building and fire department officials would be well advised to survey their manpower needs and place their requirements before the municipal authority for attention. The apathy of the public before a disaster such as occurred at the Winecoff is common, but this factor should not

deter building and fire department officials from making their needs known. Such disasters, unfortunate as they are for the victims, more often than not result in a public support for improved protection of the lives of those remaining.

2. The hazards of insufficient means of egress, lack of protection for vertical openings and other structural deficiencies which are responsible for large loss of life and property are as important to the inspection services as are the common hazards of heat, light, housekeeping, etc., and are equally important to call to the attention of building owners and managers. In both the Winecoff and the LaSalle fires none of the common or special hazards, such as kitchens, repair shops, valet shops, housekeeping, smoking in bed, etc., contributed to the eventual loss of life.

3. The knowledge and experience of the inspection staff can be enhanced, and

Typical view of corridor. Burlap and wallpaper burned from walls, door panels burned out, trim deeply charred, plaster spalled.

standards of efficiency raised to much higher levels, by the study of reports of fires involving loss of life and property in similar occupancies which are available from many sources. Hotel and other property owners need only to be convinced that conditions in their properties are similar to take the necessary steps toward remedial action consistent with the specific requirements for improvement in life safety.

4. There is much to be said for the planning of fire-fighting operations that will be necessary under varied conditions and points of origin in all places of public assembly prior to the need to use the plans. While no criticism can be directed at the fire-fighting operations in the battle against great odds in the Winecoff fire, the fact that the fire was difficult of access contributed to the loss of life. The successful fire-fighting operations in guest rooms in 1942, no doubt contributed to a feeling of confidence on the part of the fire department that it could take care of any situation which might arise in this so-called "fireproof" building.

Fire Protection and Casualty Engineers.

Fire protection engineers and also casualty engineers will find much in common in the lessons of the Hotel Winecoff fire:

1. Both fire protection engineers and safety engineers can be relied upon to apply the most rigid standards for the protection of life in the highly hazardous occupancies such as powder plants, oil refineries, grain handling operations and others accepted as inherently dangerous to life. The experience in the most recent series of hotel fires suggests an introspective look at our effectiveness in the reduction of loss of life possibilities in the occupancies generally believed of low-hazard character housed in fire-resistive structures, first evident in the Hotel LaSalle fire and proven in the Winecoff disaster six months later.

2. Delayed detection of the fire in the Winecoff corridors and the accompanying delayed alarm to the fire department were responsible for the fire being out of control on the arrival of fire fighters and rescue companies. The use of automatic detection and extinguishing equipment primarily for the prevention of loss of life will also in effect prevent loss of property.

3. The Winecoff disaster suggests the importance of private inspection authorities discussing fire-fighting operations planned in this building with the fire department officials. Such discussions could have set in motion a chain of circumstances and cooperation that would have placed more than one means of access to the guts of the structure for the fire department, and at the same time reduced the probability of heavy fire damage through spread of fire from floor to floor.

4. Standards for the protection of hazards and safety to life are technical documents little understood by the public and the architects they employ. It is unfortunate that architects receive little or no specific fire prevention or fire protection instruction in the interest of basic life-safety conditions in most architectural schools. If the architect finds standards such as the N.F.P.A. Building Exits Code difficult to interpret he needs help which can be supplied by the fire protection engineer and the casualty engineer during the design of the structure, not after it is completed and occupied.

5. As in the Hotel LaSalle lounge and coffee shop, the obscurity of the combustible interior finish materials on the walls of the Winecoff corridors contributed to the loss of life. The painted burlap wainscot unless *carefully* examined could easily be taken for a stippled paint finish of much less hazard. Once ignited the painted burlap burned with a dense smoke and fire spread rapidly over its surface.

6. The N.F.P.A. Building Exits Code is the "bible" of the casualty engineering profession, who by tradition do not concern themselves with the destruction of property by fire if they are satisfied that the building exits are such that all the occupants can safely *escape*. Unfortunately, fire protection engineers have also traditionally come to accept as their only concern the prevention of property damage. N.F.P.A. procedure requires that

A room on the top story where five women were reported found dead. The room was practically undamaged. Death was due to fire gases.

both fire protection engineers and casualty engineers participate in the preparation of the Building Exits Code, but there is a long gap to be bridged between the two points of view in reaching property owners in the field. The standards are known, but it is not clear why their application was not made in the 33-year-old Winecoff or the 37-year-old LaSalle prior to the disasters which occurred. Profiting from these incidents, the fire protection engineer and the casualty engineer would do well to get together.

Insurance Companies.

It may be of interest to life and casualty company officials to learn that on the basis of a $2,235 average disbursement by *one life insurance company* per death claim from the Cocoanut Grove, Hartford Circus and Hotel LaSalle fires (involving 200 of the dead in those fires) the life insurance claims alone for the 119 dead in the Winecoff disaster will amount to an estimated $265,000. Life insurance payments have not heretofore been included in the dollar loss figures by the N.F.P.A. Department of Fire Record, but they are a proper charge against the loss. Just one-tenth of the estimated life insurance claims resulting from the Winecoff fire would go a long way in the protection of the single vertical stairway opening, automatic detection equipment, or the correction of the transom condition which figured so heavily in the loss of life.

Many fire insurance companies have long permitted the client to assume responsibility for fire hazards in his property by the payment of the premium charged for the deficiency by the insurance rating organization having jurisdiction, particularly so if the occupancy may be classified as low-hazard. Where large loss of life is possible as in the Hotel

Winecoff, it is well worth considering whether the owner of the structure should be permitted the option to pay insurance premiums for the lack of adequate exits, unprotected vertical openings, etc., which are known by fire and casualty insurance company loss departments to be productive of heavy property damage and under certain conditions, heavy loss of life.

Legal Authority.

Legal authority as the last resort (as it properly should be), was not used to obtain the correction of the structural hazards at the Hotel Winecoff. It is believed by competent authority that the definition of "public nuisance" in the Atlanta Code was sufficient to do so. Other states and municipalities may not have a law as understandable to the layman as the Georgia law appears to be. Too much and too complicated law is as bad for life safety as none at all. The cooperation of the legal fraternity with fire protection and casualty engineers interested would do much to produce realistic and understandable legal life-safety protection for the public. Good law in the hands of adequately staffed enforcement agencies, and after all other public and private agencies have failed to obtain the needed correction, will go far toward taking care of the occasional recalcitrant property owner. Common sense fire prevention and fire protection must be laid before the property owner and rejected by him before legal action is taken to force the issue.

The Public.

Last, but certainly not least, there are lessons for the public at large in the ruins of the Hotel Winecoff. In Atlanta, and throughout the country there was, as usual after all major disasters, a wave of public indignation and the demand to "pass a law" to prevent such catastrophes. In Atlanta, as in other communities, there was and is sufficient law. To demand enforcement of the law and at the same time fail to demand that elected officials provide an adequate and well-trained staff of engineers for the enforcement agencies is a public responsibility and failure.

The public, in its indignation, overlooks the ignorance of most property owners of the simplest requirements for life safety, the resistance of many owners and managers to recommendations for the correction of fire hazards, the failure of many architects and builders to protect their clients' moral and legal obligations for the life safety for their customers without legal coercion, the pressure of politics on honest building and fire department officials, the failure of fire and casualty insurance engineers to "sell" fire prevention and safety recommendations, the insurance salesman whose only service to his client is to collect the premium, the willingness of insurance companies to permit property owners to accept responsibility for hazardous conditions simply by payment of an insurance premium for the deficiency, the lawyer who is "wedded" to the due-process clause of the Constitution of the United States and can see no justification for any reasonable requirement for life safety that can be tagged as "retroactive," and above all the failure of those who have the knowledge and experience and equipment to reach the owners of hotels and other properties with the message that could have prevented the disaster at the Hotel Winecoff.

Saskatoon Hotel Fire.

This picture shows the "fireproof" Barry Hotel, Saskatoon, Saskatchewan, after the fire of December 8, 1946, in which ten men and a woman were asphyxiated by fire gases and seventeen persons were injured.

The three-story building had brick walls and concrete floors, but interior partitions were wood lath and plaster, and the two stairways lacked enclosures. On the night of the fire some 200 persons were in the hotel.

On the street floor was a cafe where a gasoline stove was used. An employee was refilling the stove tank from a 2-gallon gasoline can when the gasoline ignited. He unsuccessfully tried to extinguish the fire, then carried the can to the hotel entrance, dropped it, and tried to kick the can outdoors. Flaming gasoline was splashed over the walls and floors and combustible partitions ignited. Fire spread from the entrance to the adjacent rotunda and to the upper floors by way of the open main stairway.

Next an attempt was made to arouse the guests by the hotel fire alarm system, but the batteries were dead. The new owner had apparently not been aware that the fire alarm was not supplied by the house current.

Then an employee ran to a fire alarm box, a block away. The alarm was recorded at 2:41 A.M.

The fire department immediately raised ladders and rescued a large number of the occupants. Many jumped from windows, which accounted for a number of the injuries. The rear stairway, and a fire escape (not shown in this picture) were also available to those who were around in time. One man is reported to have remained in his room with door and transom closed, suffering no ill effects.

This account has been prepared from a report by Chief John L. Spence of the Saskatoon Fire Department, and data from other sources.

Kentucky Hotel Fire.

Report by Kentucky Inspection Bureau.

A fire, of undetermined origin, discovered about 11:30 A.M. on Sunday, December 22, in the Kentucky Hotel, Louisville, completely gutted two communicating rooms on the ninth floor before being extinguished by the fire department. The corridors and other rooms on the ninth floor suffered light to heavy damage from heat and smoke. Slight water damage occurred in the corridor on the tenth floor and in a few rooms on the lower floors.

It is estimated that the property damage loss is about $20,000 to the building and about $5,000 to the contents. There was no loss of life or serious injury.

Description.

This is a large 18-story hotel building, of fire-resistive construction except for unprotected steel supports in portions of the roof structure, and small amounts of combustible trim and some combustible partitions in various parts of the building. Rooms Nos. 901 and 902 (in which the fire was discovered) are located on the north side at the extreme east end of the corridor in the Walnut Street wing, a point remote from the several vertical exitways in the building. These floor openings are partly unprotected and partly improperly protected. The main interior stairways discharge into the building corridors, one on the sixth floor and one on the third. From these points exit travel is down an open stairway to the main lobby. However, because of the remote location of the rooms in which this fire started, the various stairways and elevators comprising existing exit facilities were usable in this instance.

Story of the Fire.

It is reported that a maid noticed smoke issuing from around the closed door of Room 902 some thirty minutes after she saw two men leave the room. Upon opening the door, the maid was met by a wave of intense heat and smoke. Without closing the door she rushed to Room 910 and called the hotel telephone operator, who, in turn, called the fire department and then the assistant manager.

Rooms 901 and 902 are communicating and it is stated they were occupied by members of a wedding party, with the communicating door between them left open. Immediately upon receiving the alarm the assistant manager rushed to the

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ninth floor and attempted to fight the fire with a 1½-inch hose line from a nearby standpipe. The heat issuing from the rooms was so intense that he was immediately forced back beyond reach of the stream and was temporarily overcome by smoke. The fire department arrived within a few minutes after receiving the alarm at 11:31 A.M., and found both rooms completely involved, with flames issuing from the windows. Immediately upon his arrival with the first alarm apparatus, the fire chief sent in second and third alarms by two-way radio, and, also, ordered complete evacuation of the building.

Under the supervision of hotel employees, who had been instructed in emergency operations, all guests and employees were safely evacuated through the regular means of exit except one woman, who, failing to follow instructions, was trapped in her room and was taken down the 100-foot aerial ladder. In the meantime, a 2½-inch hose line was hoisted to each of the eighth, ninth, and tenth floors through exterior windows. Firemen equipped with smoke masks extinguished the fire with the single hose line on the ninth floor, in about ten minutes. The lines on the eighth and tenth floors were not needed and were placed merely as a precaution.

The actual fire was confined to Rooms Nos. 901 and 902, and the contents of these rooms were virtually destroyed and plastering on the walls and ceilings was spalled to the tile and concrete beneath. Once the fire had reached appreciable proportions in these rooms, the intense heat developed swept rapidly through the open doorway and along the corridor ceiling blistering varnish on transoms at the extreme opposite end of the hall 70 feet away. In rooms where transoms were left open, the upper parts of the door frames and transoms were badly scorched and the walls and ceilings badly discolored by heat and smoke. Where transoms were closed, there was some discoloration inside the rooms, around the upper part of the door frame, and the ceiling directly above. Ceilings and walls of the corridors throughout the entire ninth floor were discolored to a greater or lesser extent, and part of the corridor carpeting was burned. There was little damage on other floors.

Conclusions.

This fire clearly demonstrated that heat and smoke can be quickly spread throughout corridors and into other rooms by the drafts which are frequently found in hotel corridors, and which are increased by open transoms or doors. The fact that the maid left the door of Room 902 open after discovering the fire contributed to the speed and intensity with which the rooms (901 and 902) were gutted, and was also a major factor in allowing the heat and smoke to spread throughout the corridors and other rooms on the entire floor. A significant feature of this fire was the apparent speed with which smoke and heat were swept along the corridor ceilings once the blaze had gained headway in Rooms 901 and 902. It is possible that if all room transoms had been closed there would have been little damage to rooms other than Nos. 901 and 902.

The location of the point of origin of this fire was an extremely fortunate circumstance since none of the means of egress were rendered useless by the smoke and hot gases.

The hotel management is to be complimented in having trained its employees in evacuating the building in case of fire, and the Louisville Fire Department is to be commended on its operations during and after the fire.

Electrostatic Paint Spraying and Detearing.

By Matthew M. Braidech, Director of Research, and Arthur Spiegelman, Research Engineer, National Board of Fire Underwriters.

The Ransburg high-voltage electrostatic coating process* appears to be well established for automatic and continuous line-production, and holds promise of wide application in the field of industrial finishing. Its development has been along two principal lines: (1) Paint deposition through electrostatically controlled spraying, and (2) Electrostatic "detearing" or removal of "fatty edges" and "tears" of excess paint from the side and bottom drain-off points of objects which have been paint-dipped.

In general, the electrostatic process is aimed at producing a more uniform finish with substantial savings in coating materials.

All types of work can be coated by the two electrostatic procedures. They are applicable to articles made of metal (solid or wire goods), wood, earthenware or ceramics, rubber, or plastics; and can be used with lacquers, varnishes, synthetic coatings, oil paints, water-soluble materials, and even waxes. It is reported that paint requirements have been reduced 40 to 80 per cent and production output increased as much as 300 per cent.

The Ransburg Company, sole manufacturer of the electrostatic equipment, holds the patent rights. These units are not sold, they remain the property of the company and are installed on an engineering fee and license basis. Servicing is supplied periodically and upon the request of the licensee or user of the equipment. One hundred and thirty of these units are now in operation throughout the country and mass production groups, such as the automobile industry, have shown an active interest in the process.

The question of prime interest to the fire insurance and fire prevention personnel is: *Does this process add to or decrease the inherent hazards which exist in the field of paint spraying and dipping?*

Fundamental Considerations.

Solvents and thinners used in paint applications consist of varying mixtures of petroleum hydrocarbons, ethyl acetate, acetone, benzol, etc., with flash points usually well below ordinary working temperatures. The rapid and regular removal of these flammable vapors by ventilation is necessary to prevent the formation of explosive mixtures. All methods of the liquid coating industry must contend with

*Developed by the Harper J. Ransburg Company of Indianapolis, Indiana.

This study is to be supplemented by a Research Bulletin to be published by the National Board of Fire Underwriters, giving additional data on high voltage electrostatic processes, more detailed information on electric shock hazards and a bibliography. The authors wish to express appreciation to the following for their cooperation in the survey and in the preparation of this report: Harper J. Ransburg Company, Indianapolis, Indiana; The Underwriters' Laboratories, New York and Chicago; Mr. Benjamin Richards, Mgr., Underwriters Service Association, Chicago, Illinois, and Chairman of N.F.P.A. Finishing Processes Committee; Mr. R. C. Loughead, Chief Engineer, Michigan Inspection Bureau, Detroit, Michigan; Mr. Winthrop M. Jones, Chief Engineer, Eastern Regional office, Factory Insurance Association, Hartford, Conn.; Mr. John A. Dickinson, Chief, Safety Code Section, National Bureau of Standards, Washington, D. C.; Mr. Charles F. Dalziel, Associate Professor of Electrical Engineering, University of California, Berkeley, California. Acknowledgment is also given to many electrical power companies for their opinions and suggestions.

this problem and it therefore follows that the electrostatic equipment will necessitate care in handling certain phases of it.

The principal hazards causing most of the fires in paint-coating processes should be considered concurrently with this newer process. These may be grouped for review as follows:

(A) *Causative Factors in Spray Booth Fires:*
- (1) Broken electric lamps and other electrical defects.
- (2) Careless handling and spillage of paint materials.
- (3) Cleaning interior of booths, fans and motors with highly flammable solvents.
- (4) Accumulation of paint deposits in booths, ducts, and vent pipes, resulting from neglect to clean them frequently.
- (5) Defective fans and faulty location of motors used for ventilating booths.
- (6) Poorly designed and guarded vent ducts.
- (7) Static electricity.

(B) *Causative Factors in Dip-Tank Fires:*
- (1) Permitting explosive solvent vapors to escape from the dip tank and drainboard into improperly ventilated areas.
- (2) Large open areas of paint in tanks, causing an increased exposure to flash fire.
- (3) Spark hazards from electrical lamps and other electrical equipment and processes in vicinity of dip tank.
- (4) Static electricity from movable belting or other source.

The effects of the electrostatic spray and detearing equipment on the above-mentioned hazards are as follows:

(1) A new potential source of ignition is introduced through the possibility of electrical discharge occurring between the work or apparatus and the surrounding electrodes.

NOTE: The term electrical discharge is herewith used to broadly cover either an arc or spark. When considering high voltage apparatus it is possible for such phenomena to exist in three different forms: (1) as an intermittent or continuous, silent glow or corona discharge in a widened gap between the electrode and the distant conductor; (2) as a sudden disruptive (or immediately quenched), intermittent, luminous discharge from the electrode to a nearby conductor — this may be termed a spark; (3) as a sustained or continuous flame-like discharge from the electrode to a closely drawn conductor — this may be termed an arc. The contributive fire hazard will be the same for both arc or spark.

(2) The life hazard to operators is increased through the possibility of an electric shock due to failure, misuse, or faulty equipment. This electric shock would not necessarily have to be fatal to be dangerous, since it might result in any of the following conditions:
- (a) Painful shock due to sudden and unexpected contact.
- (b) Resultant action from shock contributing to secondary hazard.
- (c) Possible skin and flesh burns at points of contact.
- (d) Possibility of a fatality if victim were not able to let go his grasp of an energized conductor within a reasonable period of time — a factor depending to a great degree upon his physiological condition.

(3) The expectance that the spray booth will be cleaner due to the great reduction of paint overspray and the elimination of waste residues from floor, walls, and vent stacks, thereby reducing hazards from that common source of trouble.

Principle of Electrostatic Treatment.

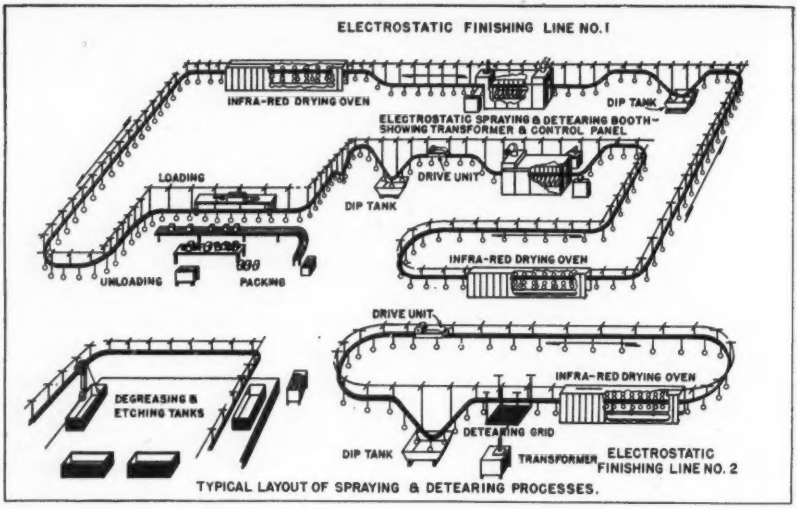
The electrical principle of this process is somewhat analogous to that used in the manufacture of certain abrasive papers (sandpaper and emery-cloth) and, more particularly, to that of the well-known Cottrell electro-precipitation process which has found common application in the chemical and metallurgical industries for the removal of fine dusts and fumes appearing as by-product wastes from smelters, roasting furnaces, and cement kilns. The basic law of physics that unlike electrostatic charges attract and like charges repel, is the common foundation of these various processes.

In the electrostatic deposition treatment, the paint-spray particles are passed through an electrostatically charged field and assume the charge (negative) of the surrounding electrodes. These energized paint particles or finely divided droplets are then uniformly attracted to the material to be coated, which is grounded to

the conveyor and is of the opposite polarity (positive). As the work to be coated is carried by the conveyor centrally through the high-voltage region, these particles become firmly attached to the work and build up the desired coating. The article is completely enveloped on all sides, top and bottom, with a "wrap-around" coating. The resulting coating is exceptionally uniform and because practically all particles experience this strong attractive force regardless of their direction of travel from the spray source (particles will turn 180° and coat the back of the object), the finished surface is coated at very high degrees of efficiency.

In the actual operation, a supply of paint is introduced at a low velocity, through suitably arranged spray guns, into the ionized zone. The article to be coated is suspended from or attached to a grounded conveyor and advanced, usually from a rear side opening, through the booth toward the discharge of the spray guns. At the spraying position, a cage-like frame arrangement of exposed (not insulated), fine copper wires, encompassing the article, has a high voltage charge imposed on them and virtually forms an electrostatic curtain of negative charge about the article, causing the atomized spray to be diverted by the electrodes and deposited on the positively charged object (which is connected through the ground to the positive side of the power pack) with a minimum loss of spray material.

In the dip-paint method, where electrostatic detearing is employed, the above electrical phenomenon is somewhat reversed, and an exposed grid functions as the negative electrode. In this process the article is hung on work hooks attached to an overhead conveyor which is grounded in the same manner as the spray set-up. The article is dipped in the usual manner, or flow-coated, and is usually passed over an inclined drainboard, which collects the excess paint which occurs in the heavy flow of the early stages of the process, and returns this excess paint to a tank. The coated article is next allowed to "air dry" or "set" sufficiently so that the flow has practically stopped — the required time depending on the shape of the article and the characteristics of the paint formulation employed. When free flow has practically stopped and only the last drip or tears remain, the article is carried over an electrically charged (negative) detearing grid, which is energized at the proper voltage, and an electrical force of attractions is thus established between the grid and the various parts of the grounded article. The resultant attractive force acts on the residual excess coating, appearing in the form of "tears" or "drip" accumulations, causing it to be drawn off towards the grid in spurts of minute streamers and stringy threads at various points, and producing a more uniform and better distributed coating on the object. This force is particularly strong at certain points or prominences (such as corners and edges) where concentration and drain-off is apt to occur. The detearing action will continue to remove the coating material until an equilibrium is established between the contractile force created by the surface tension of the coating adhering to the work and the electrostatic pull created by the electrode grid. For best detearing operation, it is necessary that the radius (not exceeding ¼ in.) of the drain-off point on the article be reduced to a minimum and should be held away from but exposed toward the electrode. It has been reported that the maintenance of a negative polarity on the electrodes carrying the



TYPICAL LAYOUT OF SPRAYING & DETEARING PROCESSES.

directing charge will permit higher voltages before sparkover occurs.

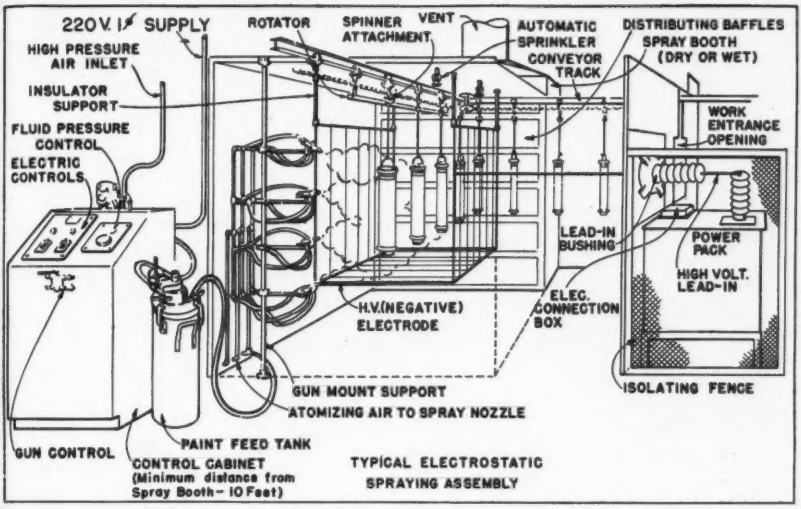
The source of voltage in both methods is an electrical power unit, which employs voltage step-up and half-wave rectification, and produces a pulsating, unidirectional, high potential current. The detearing process employs a slightly lower voltage at correspondingly lower current consumption than the electrostatic-spray technique.

After the respective spraying or detearing operations, the coated work usually proceeds into auxiliary ovens or dryers (electric lamp dryers are often used instead of ovens) where the coating is cured or baked to a hard finish. Upon leaving the oven the work travels a sufficient distance to cool, following which it is removed from the conveyor and may be immediately wrapped and packed for shipment. In some instances, the work is subjected to a second spraying or dip treatment and again subjected to electrostatic processing to control the repeated or double coating.

A certain degree of correlation of the various influencing factors is necessary to obtain best operating results (these items also have a bearing on fire safety). Due consideration must be given to type, size and shape of article, electrode spacing, formulation and fluid-consistency of coating materials and evaporation speed of solvents, atomizing pressure or pre-drying requirements, and conveyor speed, to establish the optimum conditions. There are certain articles that lend themselves more readily to one than to the other type of electrostatic treatment, and this is predetermined by consideration of the above controlling factors and by preliminary trial runs.

Spraying Equipment and Process.

The electrostatic spraying apparatus consists of three distinct units, namely the power pack, the control cabinet, and the spray section. The spray section includes the electrodes, spraying enclosure and venting system, conveyor, and spray guns. This equipment is so arranged and so fully automatic that the entire process can be operated from a central control panel.



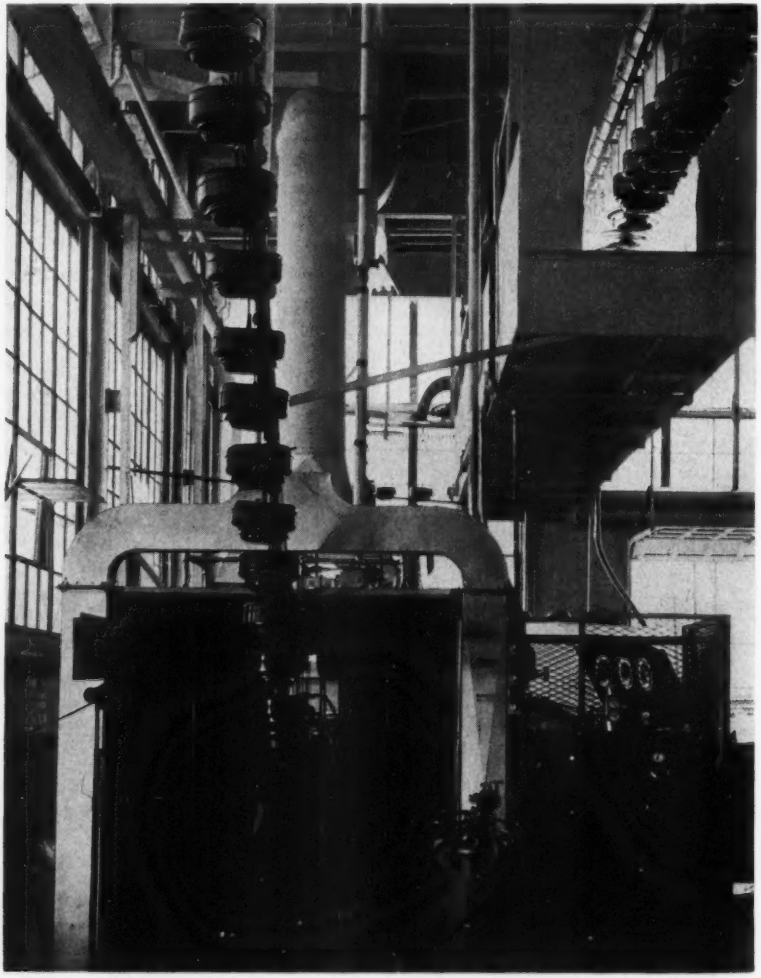
As in all automatic processes, effective results are obtained only through complete coordination of all of the component units and materials involved. Thus, the rate at which the fluid is supplied to the spray guns and the atomizing pressure of the paint must be adjusted to the conveyor speed and coating requirements and then maintained constant during the entire operation. The voltage applied to the field should be fixed in any particular installation at one value and the electrodes should always be positioned so that no part of the objects will ever approach closer to the electrode than twice the probable spark-over distance (recommended at 12 inches). The placement of the spray gun, and the control of its orifice opening (which determines the amount of fluid issued), to assure uniform size distribution of the paint particles, are also prime considerations. Thus it can be noted, that even though the process is almost fully automatic, it requires due care and knowledge of application to operate successfully and safely.

The Power Pack: The high voltage electrical energy required to operate the process is obtained from the unit referred to as the "power pack," which contains a high reactance transformer and a rectifying vacuum tube, both being compactly immersed in a transformer oil. This unit contains 100 gallons of a transformer oil having the following fire and electrical characteristics: flash point 271° F., fire point 298° F. and a dielectric rating of 26,000 volts per 0.1 inch.

By means of this equipment, the commercial 220 volt, single phase, 60-cycle alternating current is stepped up to 130,000 volts and then given a half-wave rectification. It is claimed that the present unit is so designed that it will deliver a maximum current not exceeding 10 milliamperes average on a dead-short. It is reported that occasional replacement of the half-wave rectifier tube is necessary. This is partly due to a fluctuation of the incoming voltage, and the equipment manufacturer is now planning to install a suitable constant-voltage-regulator to over-

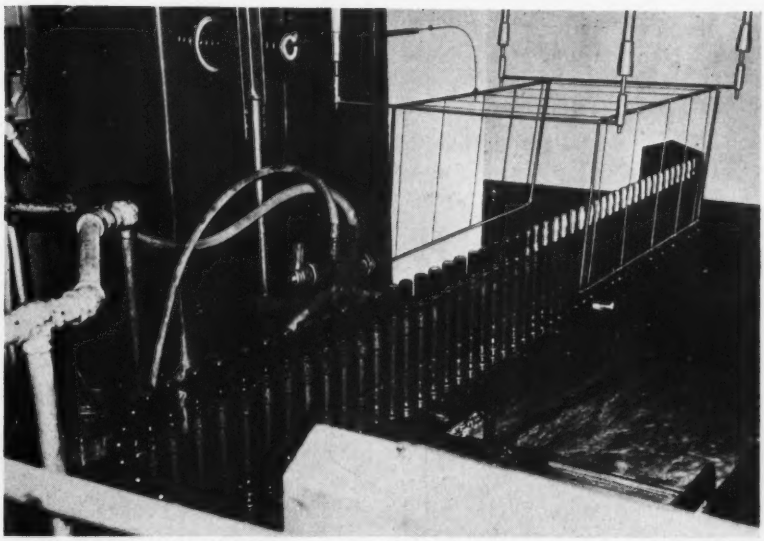
come this troublesome feature in the equipment. The rectifier is readily checked with a neon tube supplied with this equipment (glow of the two electrodes in the tube indicates full-wave passage of the original current or failure of proper rectification; glow of a single electrode signifies presence of the rectified half-wave or proper operation), and any needed replacement of the tube is easily made through a removable panel on the upper side of the power pack container.

Two leads pass from the high-voltage secondary coil of the power pack; one is



Electrostatic spraying of automotive air filters and drying in infrared oven.

Note: The present limitation of control cabinet distance is 10 ft. from the spray booth. The manufacturers are contemplating isolation of the electrical from the air-pressure controls of the paint spray system in the near future, in order to bring the latter controls nearer the booth, which will promote greater efficiency of operation.



Electrostatic spraying of metal radio tubes, showing spray gun mounting, electrode structure (negative polarity) around spraying zone, and conveyor line (positive polarity).

grounded (connected to the grounded conveyor and work) and the other, by way of the rectifier tube, becomes the lead-in for the charged electrodes surrounding the work. The wire leads of this particular connection are bare and are guided into the spray booth by a porcelain "through-the-wall" insulator-bushing.

Control Cabinet: The control cabinet is in reality the workbench for the electrostatic spray operator, and provides him with the following controls and gauges:

(1) Power control to filament transformer for rectifying tube and pilot signal.
(2) Power control to high voltage transformer and pilot signal.
(3) Main line pressure regulator and gauge.
(4) Atomizing pressure regulator and reduced pressure gauge.
(5) Fluid pressure control and gauge.
(6) Spray gun control valve.

Adjacent to this cabinet in a readily accessible position are also placed:

(1) The main power switch.
(2) Ventilation equipment switch.
(3) Conveyor line switch.

When installed, the equipment is electrically connected so that the electrostatic field cannot be established until after the ventilating system and conveyor are both in operation and so that failure of either the conveyor or ventilation equipment to operate will automatically de-energize the field. For this reason the main switch, the ventilation switch and conveyor switch must be thrown to initiate the operation.

The power control to the filament transformer is regulated by an "on and off" push button switch. When this switch is in the "on" position the pilot signal on the panel board lights up. The high voltage transformer is controlled by the same type of switch and its "on" position is similarly indicated by a red pilot light. With the conveyor running at a uniform speed consistent with the drying cycle and the ventilation provided, the two switches on the panel permit the establishment of the electrostatic field.

The air controls in the panel per-

mit control over the introduction of the atomized coating material. The incoming air pressure from factory supply is registered on a simple gauge associated with a primary air regulator. This main line pressure is reduced for use as atomizing air at the guns, since the process requires a "soft" or low pressure spray. This reduction is accomplished by the primary air regulator and the reduced pressure is likewise indicated on a gauge. By means of auxiliary regulators within the cabinet the main line pressure is reduced for use as fluid pressure and is applied to the paint tank. This pressure value is indicated on a third gauge and its value is controlled from a provided regulator. With these pressures adjusted to suitable values a hand valve on the panel permits operation of the spray guns and the utilization of these pressures to effect the desirable introduction of coating material into the electrostatic field.

The spraying is adjusted for continuous operation, and in its present stage is not applicable for manual or automatic stop-and-go control.

The Spray Section: The spray section consists of several pieces of equipment. It is while being carried through this spraying section by the conveyor that the work receives its liquid coating. The following units are included in this section:

(1) Spray enclosure (booth).
(2) Ventilating equipment.
(3) Electrodes to create an electrostatic field.
(4) Spray guns and paint container.
(5) Conveyor for work, fitted with job holder.

The spray enclosure is usually of the normal type, except that it must be built of non-conductive material. A conveyor line inlet and an outlet, large enough to allow the work to enter and leave, and openings for admitting and exhausting the air from the enclosure uniformly are necessary. Special attention should be given to fire protection. Automatic extinguishing equipment meeting code requirements should be provided before operation of the electrostatic unit is permitted.

The ventilation system is an important factor in the safe operation of the process, so provision should be made for automatically shutting down the electrostatic unit in the event that the ventilation should break down or inadvertently be shut off.

The electrode structure, used to produce the electrostatic field around the spraying zone, is located within the spray booth, and comprises a rigid frame mounted to surround an area in the path of travel of an overhead monorail or other suitable conveyor. The structural assembly of thin wires (four or more, equally spaced around the rigid frame) is supported by four or more non-conducting rods, suspended from the roof or walls of the enclosure. This framework may be adjustable as to position and distance from the work passing through, in those cases where more than one type of item is to be finished. The size, configuration, and contour of a particular job to be sprayed determines the setting of the electrodes. The job should be mounted so that its sides do not cause a dangerous electrical discharge by approaching too close to the electrode. The equipment manufacturer recommends that the distance between the work or spray gun and the electrode members should never be less than 12 inches. (No spark occurs until the distance is reduced to 5 to 6 inches). A limit switch should be placed just ahead of the electrode system on the outside of the booth, and this safety device should be arranged to de-energize the field and stop the conveyor, in the event an item is carried out of line

in such a position as to approach too close to the electrodes.

The spray gun or paint atomizer operates with a low atomizing pressure of approximately 15 to 20 psi and a fluid pressure of 4 to 5 psi and and requires spray nozzles which will diffuse and distribute the paint particles in a mist or fog-like form with little velocity. Special nozzle tips have been developed for this operation. In ordinary paint spray, the mechanical velocity forces the paint on to the work, as rapidly moving, atomized paint particles, but in the Ransburg method, the electrostatic force draws the paint spray, and causes the precipitation. The particle size of the paint and the solvent balance is extremely important from the standpoint of successful operation. It is possible that the solvent will evaporate before the moist paint particles have been deposited on the work. This will cause a dry powdered paint to precipitate in the form of a poor coating on the article. The spray nozzle opening is important in that it must remain clean to insure constant delivery and not be too large to release a vapor mixture of an explosive nature into the electrostatic field. Spray guns must be fixed and securely mounted (sometimes arranged in multiple fashion) and properly placed, and directed, tangentially toward the work (axis of spray is usually at a 15° angle) so that the paint particles will precipitate uniformly on the articles at approximately 22 to 24 inches from the spray nozzle.

The conveyor used to deliver the work into the field of operation should be of sturdy construction and the "work hooks" of proper design to firmly hold the goods. This is necessary to avoid electrical discharge through accidental falling, turning or swaying of the work into the critical area of the electrode. Regular monorail, overhead, spindle, or belt type conveyors can be used with little change. The conveyor speed will range from 3 to 80 feet per minute, depending on the job.

Detearing Equipment and Process.

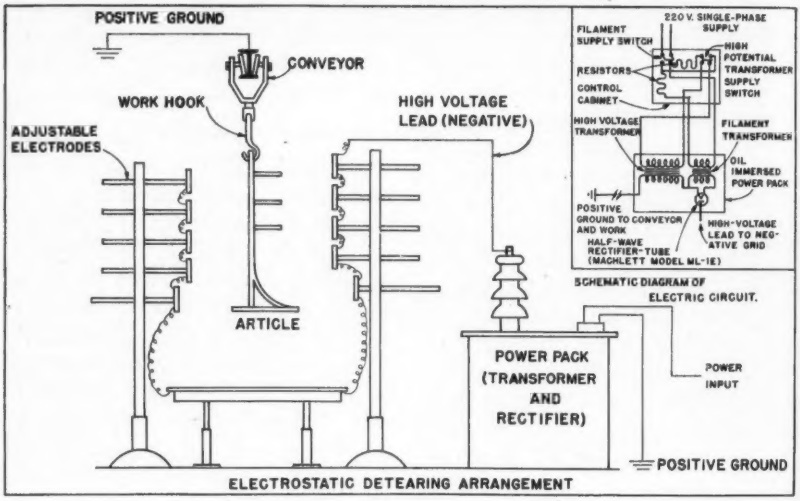
The detearing process is similar to electrostatic spraying with respect to the correlation of the various factors involved to achieve the best results. The liquid coating must be of correct viscosity and solvent balance. It is also necessary to control the conveyor speed, the distance between the dip tank and detearing electrode and the length and spacing of the electrode or grid. The work should arrive over the detearing grid when the paint has flowed to the last tears, then the detearing process will remove the final tears, avoiding any deposit in the oven — which is a desired result. The shape and exposed area of the work are very important in determining the abovementioned factors.

A definite sequence of operations is involved in the dip-detearing process. The work is delivered on a grounded conveyor and the exact line of flow in this procedure is as follows:

(1) Application of coating through immersion in dip tank, or similar method.
(2) Conveying over drain board and air drying.
(3) Passing over the electrostatic grid for "detearing."
(4) Drying of the work by air, ovens or other drying methods.

Dip Tank: The dip tanks used in the application of the coatings in conjunction with the Ransburg detearing equipment are similar to those used in the regular paint-dip operations.

Drain Board and Air-drying: The work is carried by means of a grounded (positive) conveyor from the dip tanks over a drain board. This drain board and the supports are made of non-combustible



ELECTROSTATIC DETEARING ARRANGEMENT

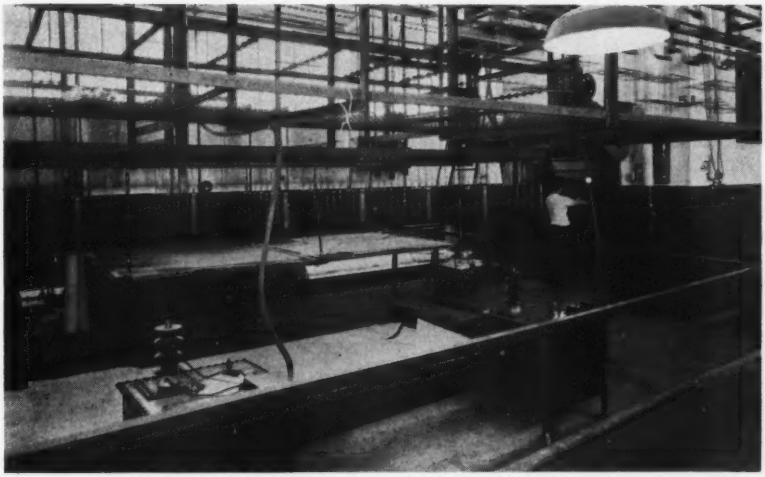
materials, and it is recommended that they should lead into a closed drain tank rather than return excess paint to the original dip tank. This is advisable to prevent water from flowing by this means into the dip tank in case of fire. The length of the drain board is determined by the air drying time and the flow of paint from the article.

To promote good housekeeping, heavy roll-paper is sometimes laid on the floor along the path of the conveyor to catch the last drippings of the coated work as it travels from the drain trough to the detearing grid. The practice of covering the grid with paper to facilitate troublesome cleansing of the screen-like electrode, is also followed occasionally. This is not recommended by the manufacturer since it interferes with free circulation of the air through the grid. Replacement of the coated grid, when necessary, is more desirable.

Detearing Grid: The electrostatic detearing electrode follows the drain board in the line of operation. The detearing device consists of removable negative grids, made of any conductive material, the power pack, and control board. The size and spacing of the grid electrode is dependent on the particular application. It is of a more substantial structure than the electrode used for the spraying device, since the latter must be replaced and handled to rid it of accumulated material.

The distance between dipping and detearing operations may vary widely, depending upon the time required for gravity drain-off to substantially cease and the speed of the conveyor. The time interval is determined by the size and shape of the part, the solvent evaporation rate, the temperature of the part as well as the amount of air movement. Usually this time interval would be between 1 minute and 10 minutes. The length of time required for the detearing operation is largely dependent upon the radius at the point of drain-off. In most cases it will require between 15 seconds to 1 minute.

To avoid the accumulation and entrapment of flammable vapors in hollow and tubular articles, and, at the same time, prevent the formation of explosive mix-



Electrostatic detearing in the processing of dip-coated shells.

tures around the detearing grids, upward-movement ventilation by directed air pressure and by exhaust ducts located directly over the grid structure should be provided specifically for this purpose.

Power Pack: The detearing power pack is very similar to that used for electrostatic spraying with the exception that the voltage and the current output are less. This smaller unit contains 55 gallons of the transformer oil. In the detearing power pack the 220-volt, single phase power supply is transformed and half-wave rectified to about 85,000 volts, with a reported current of 5 milliamperes on a dead short. The control board on the detearing unit is similar to the spraying device with the exception that pressure and spray valves and gauges are unnecessary. The control unit can be arranged for convenient wall mounting and usually occupies less space than the spraying unit.

The distance between the electrode and the work on the conveyor is held to a minimum of 8 inches to prevent possible arcing (no spark occurs until the distance is reduced 3 to 4 inches). This, in turn, brings up the importance of well-constructed and designed work hooks on the conveyor. If the articles do not hang securely, there is a tendency for swaying and accidental dropping on to the electrode and causing a sparkover which would produce a source of ignition in the midst of a flammable paint mixture. These accidents have occurred and there is a personal equation involved where the operator does not place the work on the conveyor properly.

Drying Ovens: The drying process which follows the detearing operation in the line of work may be any one of a number of standard designs. The drying is often tied into the whole process and a fire starting at any point in the operation may involve the entire process. It is therefore important that all standards for good drying oven procedure should be adhered to. The ventilation is important, and such maintenance features as the control of infra-red lamps to prevent breakage, etc., are of prime consideration.

Typical Fires.

(1) A large midwestern company was engaged in the manufacture of 75mm steel cartridge cases. The process called for the application of a protective coating and the electrostatic detearing apparatus was used in conjunction with a dip process to accomplish this. As the shells passed over the detearing grid an accidental sparkover, caused by the lessened distance of a fallen shell resting on the charged grid, ignited the explosive mixture of air and solvent vapor which accumulated at the open end of each shell. A flash back to the dip tanks started a fire which was further aggravated by the scattering of the flaming paint through the release of water into the dip tank.

After repairs, it was discovered that the interior of the shells had become saturated with alcohol vapors during the air-drying period of the coating process. The solution to the problem here was found by blowing air jets at the open ends and into the shells during detearing. This ventilated the explosive mixture from the area adjacent to the grid-electrode and around the mouth of the shell.

(2) A fire occurred at a plant which was applying liquid coatings to mine crates. The paint dip and electrostatic detearing method was used in this instance. It is believed that the ignition occurred in the vicinity of the detearing grid and the fire carried back to the dip tank.

(3) An automotive parts plant was the scene of a recent fire. The housing which is placed around the axle of an automobile was being coated by the electrostatic spray method. Through careless operation the spray gun was placed about seven inches from the electrodes and a sparkover and fire occurred in the heavy paint coatings on the spray booth and on the electrode. Poor housekeeping was a contributing factor.

(4) Hermetically sealed, loaded, ammunition boxes were being sprayed by the electrostatic precipitation method in a government ordnance plant. One of the electrode wires broke and snapped against a loaded ammunition box on the moving conveyor line. The box flashed into flame but an alert worker, who quickly removed the burning box from the line, prevented a catastrophe. The fire was quickly extinguished; the worker received a number of minor burns.

Possible Causes of Incidents Involving Electrostatic Treatment.

The sources or causes of incidents which center about the electrostatic spraying and detearing equipment can be grouped into two major categories:

(1) The potential source of ignition introduced through the use of a high-voltage electrostatic field.

(2) The possibility of an electrical shock hazard through relatively exposed conditions in close quarters.

With respect to the first item, which bears directly on the fire hazard problem, it should be pointed out that the critical electrical discharge distance is greatest in the electrostatic spraying arrangement; greater electrodes-to-object clearances must be maintained in this particular process. In this equipment the power pack is designed for 130,000 volts, making it possible to cause a sparkover with some objects as they approach within 6 inches of the electrode, whereas, for the detearing system, the capacity of the power unit is reduced to 85,000 volts, with a corresponding discharge distance of 3 to 4 inches. There is no fixed limit to the voltage usable; further developments may include higher potentials and greater discharge distances.

In considering the addition of a source of ignition through electrical discharge, the following danger spots or causes may be listed:

Electrostatic Spraying System:

(a) Bringing the work too close to the electrode through poor planning or design of work hook.

(b) Careless operation which allows the work to fall or sway within the critical discharge distance of the electrode.

(c) Placing other grounded equipment such as the spray gun within the critical discharge distance of the electrode.

(d) Breaking of electrode wire so that it snaps within critical distance of the conveyor or work. This may be caused by twisting a wire to take up slack. Contact is also possible if these wires become loose, unadjusted, or sag.

(e) Poor insulation between the electrodes and the grounded equipment or breakdown of this insulation which will cause arcing. Paint accumulation over insulator supporting the electrode cage may cause electrical discharge.

(f) Plant overvoltages or line surges may increase the critical arcing distance, thereby causing the work to enter the zone of potential ignition.

(g) Objects having sharp corners, especially sharp points, greatly increase the critical discharge distance and potential ignition.

Electrostatic Detearing System:

(a) The work may fall from the conveyor on to the electrode. Other articles passing over may cause an electrical discharge to occur to the fallen piece, because of the decreased clearance.

(b) The work may be carelessly placed on the conveyor or the work hooks may be improperly designed, thereby allowing articles to sway within the critical discharge distance of the electrode.

(c) Poor insulation between the electrodes and grounded equipment or a breakdown of existing insulation which may cause an electrical discharge. This can be caused by excess paint or other materials bridging the gap between two oppositely charged parts of the equipment.

(d) Paint may coat the grid to such an extent that the unit will be ineffective and will require replacement with spare grids and frequent cleaning with solvents.

(e) Plant overvoltages or line surges may increase the depth of the critical discharge distance thereby causing the work to enter this dangerous zone.

(f) Interchange of a spraying power pack to the detearing system without making proper adjustments to cope with this increase in voltage and amperage.

The second item, concerning the personal shock hazard on contact with live electrical circuits, is one which deserves the more detailed consideration. Although much has been published on the subject of electric shock, there is considerable misconception and lack of proper knowledge on this important subject. For example, the average individual generally thinks of the hazard of electrical shock in terms of high voltage and does not always realize that it is primarily the current and not the voltage that produces the fatal results. While most of the studied opinions indicate that a 5 milliampere current (encountered in the detearing power pack) will not cause a shock leading to lethal effects, however, due consideration must be given to the possible consequences of startling a person, without warning, by an accidental or direct contact with exposed circuits. Such a situation might cause a momentary loss of balance which could precariously precipitate the victim into a secondary hazard, and perhaps be contributory to creating a condition for explosion and fire. With respect to the 10 milliampere current encountered in the higher rated power pack of the spraying treatment, the approach to the danger zone is much closer, and particular regard should be given in this connection to line surges and overvoltage possibilities, or rectifying tube failure. Considering further that these processes involve pulsating, half-wave rectification, the victim would be subjected to a more severe experience because of the greater "freeze" possibilities.

The manufacturer reports that their experience with the process in test, development and installation has been favorable and that no serious incident has occurred. However, they do recognize the existence of this potential hazard and govern their operations and instructions to the users accordingly.

General Conclusions.

These electrostatic processes introduce two new hazards in the field of paint application. First, that of a new source of ignition in the form of an electrical discharge in the field of explosive vapor mixtures. Second, that of personal injury to operating or fire fighting personnel from "high voltage" electric shock.

The first of these can be cared for by adequate ventilation which is made easier by a decrease in the amount of paint vapor in the electrostatic spray unit and the fact that most of the paint drips from the work before entering the electrostatic field of the detearing unit. Proper arrangement and layout of the equipment, and adjustment of the variable functions of the process, especially as the operations are automatic, will be a material factor in lessening the danger of producing a flammable mixture and of causing ignition. The interlocking of various operating switches to prevent utilization of the power pack except with full operation of the process is very desirable.

The second condition is a matter of proper safeguards and is not a material factor. The operations are automatic and no one need be in close proximity to the exposed electrodes. They can be safeguarded against through proper design, rigid testing, inspection before shipping and upon installation, and maintenance inspection at frequent intervals.

Codes.

Standards for the safe installation and operation of paint spraying and dipping processes, developed by the N.F.P.A. Committee on Finishing Processes, have been published by the N.F.P.A. in the National Fire Codes, Vol. I, and by the National Board of Fire Underwriters in Pamphlets No. 33 and 34. These standards cover the important precautions that apply to all such operations. The following provisions on the electrostatic spray process were adopted in 1946 as an additional section of the Standards on Paint Spraying and Spray Booths:

101. Electrostatic apparatus and devices used in connection with paint spraying operations shall be of approved types so far as such approval applies.

102. Transformers and power packs shall be located outside spray booths or enclosures, and areas subject to paint deposits. A minimum detachment of 10 ft. should apply for control cabinets.

103. The installations shall be in accordance with the National Electrical Code insofar as such applies.

104. Electrodes shall be rigidly supported in permanent locations and well insulated.

105. A space shall be maintained between goods being painted and electrodes or conductors at least twice the possible sparking distance.

106. Goods being painted using this process are to be supported on conveyors except as provided in Art. 107. The conveyors shall be so arranged as to maintain safe distances between the goods and the electrodes at all times. Any irregularly shaped or other goods subject to possible swinging or movement shall be rigidly supported to prevent any swinging or movements which would reduce the clearance to less than that specified in Par. 105.

107. This process is not approved where goods being painted are sprayed and manipulated by hand, unless non-combustible baffle plates are installed to prevent the goods from being moved nearer to the electrodes than the required clearance specified by Par. 103.

108. Electrostatic apparatus shall be equipped with automatic control arranged to make the entire equipment dead if vent fans or conveyors stop.

109. Where required, adequate fencing, railings or guards shall be provided, to maintain a safe isolation of this process from other work or storage in the area and to guard personnel. It is desirable to have such fencing, railings, or guards at least 5 ft. from the process equipment.

110. Signs designating the process zone as dangerous as regards fire and accident should be posted.

111. Electrode insulators shall be kept clean and dry.

The following provisions on the electrostatic detearing process, have been recommended by the N.F.P.A. Committee on Finishing Processes as an additional section of the Standards on Dip Tanks Containing Flammable Liquids:

401. Electrostatic apparatus used in dipping operations shall be of approved types so far as such approval applies. Entire installations shall be subject to the approval of inspection departments having jurisdiction.

402. The installation shall be in accordance with the National Electrical Code so far as such Code applies.

403. Transformers, power packs and all electrical controls shall be located at least 20 ft. from dip tanks and drip boards unless separated therefrom by a complete non-combustible enclosure.

404. All electrodes shall be rigidly supported and well insulated.

405. Minimum spaces from electrodes and high voltage conductors to the goods being painted, shall be maintained beyond the expected possible sparking distance and to other grounded objects and between conductors a space of at least 12 inches shall be maintained.

406. All goods subject to this process are to be handled on conveyors except as provided in Article 407 and are to be so fixed to the conveyor that the minimum spaces shall be maintained as specified in Article 405, under all circumstances. This prohibits goods so hung as to make possible their turning or swinging to positions beyond the specified distance, but non-combustible baffles may be installed in such cases to maintain the clearance called for in Article 405.

407. This process shall not be employed where goods being dipped or drained are manipulated by hand unless baffles are provided as specified in Article 406.

408. Automatic control shall be provided to make the entire electrostatic equipment "dead" when ventilating fans for the area and conveyors are not operating. Ventilation shall be upward through detearing grids.

409. Adequate fencing, railings or guards shall be provided to maintain a safe isolation of the process to guard personnel and to separate the area from other work and storage.

410. Signs designating the process zone as dangerous as regards fire and accident shall be posted. (Such as "Danger; High Voltage; Fire and Accident Hazard.")

411. Apparatus shall be maintained in good condition with all conductors well supported and the entire equipment shall be kept clean and dry.

412. Drip plates and screens subject to paint deposits shall be removable and shall be taken to a safe place for cleaning.

Supplementary Recommendations.

In addition to the code provisions quoted above, this survey suggests the following supplementary precautions:

Operation.

(1) Allow only persons qualified by training and experience to work around the electrostatic apparatus.

(2) Do not allow any persons to work on the electrostatic equipment while the current is on.

(3) The electrodes in either of the two processes should be adjusted by responsible employees who are fully aware of the ignition and shock hazard involved through careless contact or bringing the electrodes too close to the grounded parts.

(4) Shifting of the higher capacity power pack of the electrostatic spraying unit to the detearing unit should be prohibited.

(5) Protective barriers should be provided to prevent direct contact with exposed circuits, and the bare lead wires should be protected by non-conductive and non-combustible guards.

(6) The neon tube, used to indicate the presence of rectified and unrectified alternating current, should be handily mounted in close proximity to the power pack, and employed to test the rectification at frequent and regular intervals throughout the operating day.

(7) A red signal lamp, serving as a warning that the current is turned on, should be provided and located at a conspicuously visible point on the spray booth or detearing assembly.

(8) Provision should be made for a main control switch, remotely located and readily accessible in any emergency.

Inspections.

Arrange for proper maintenance of equipment, loads and wiring, with careful and frequent follow-up inspections to see that the various parts of the installation are properly coordinated and in good working condition. This inspection should be made with the current off. The inspector should be particularly concerned with the following conditions:

(1) Check all electric terminals, electrodes,

and insulations. Particular attention should be paid to possible condensation on insulators during humid days.

(2) The conveyor systems and work hooks should be carefully examined to determine balance-stability and distance from the electrodes for each individual job. Proper operation of the "limiting switch" should be insured. The same inspection should be applied to the infra-red ovens and other drying auxiliary equipment which comprise a part of either electrostatic system.

(3) Check spraying equipment with particular attention to the spray-gun tips.

(4) The compressed air employed in the feed-pot and the spray gun should be checked for moisture. To avoid carry over of entrained water from the compressors, the compressed-air storage tank should be drained regularly.

(5) Extra care should be exercised for fire or explosion possibilities during the setting-up or tuning of trial or experimental runs with new goods and changed paint formulations, paying particular attention to the so-called metallic-pigment paints.

(6) Check means of shutting down the process during emergencies, such as failure in ventilation system and occurrence of fire.

Fire Safety and First Aid Measures.

(1) Good housekeeping principles should be maintained with this equipment. When roll-paper is used to catch paint drips in the detearing operation it should be replaced frequently and disposed of in such a manner that no hazard is created.

(2) The fire protection equipment should be checked regularly. If any of the sprinklers, located in the spray booth and around the dipping process, are found coated with paint or having excessive deposits, or are found in a doubtful condition, they should be cleaned or replaced with new heads.

(3) All auxiliary portable fire extinguishers, in the immediate electrostatic treatment area, should be of a type approved for use around electrical equipment, and should be kept in good working order, and in their designated places and be readily accessible.

(4) Workers should be trained in proper fire fighting procedures and in applying first aid in electrical shock emergencies.

Large Loss Fires of 1946.

Once again, there were more large loss fires reported to the N.F.P.A. during the past year than in any previous year in our history. The total for 1946 is 187 fires individually causing damage in excess of $250,000. The total estimated destructiveness of these fires is over $120,000,000.

The 1946 record tops by 24 the high of 1945. Both years' totals include only those fires reported to the N.F.P.A. which have occurred in the United States, Canada, Alaska, and Newfoundland. In 1944 there were 122 large loss fires and in all previous years for which we have records the total has been under 100.

Only those fires are included where the loss estimate can be realistically set at over the $250,000 mark.

Many fires causing indirect losses far in excess of $250,000 to the owners of the property are not included. Except where business interruption or rental value insurance coverage is involved, and the loss reported, there is no way to estimate the intangible financial burden which so many "ordinary" fires impose.

Occupancy Distribution.

Four general occupancy groups account for 72% of all the large loss fires. Manufacturing plants, as would be expected, suffered the greatest number with 49 out of the total of 187, followed closely by warehouses (including grain elevators) with 40. A newcomer in the higher brackets is the aviation field with 24 large loss fires, 21 of which involved aircraft fires in flight or at time of crash. The year 1946 marked a decided increase in group fires with the total causing damages over $250,000 set at 22. In 1945 there were only eight in this category, including 2 conflagrations. Particularly significant also during the past year are the 5 tragic hotel fires costing the lives of 210 persons. An increase in the number of disastrous fires in waterfront properties over that of previous years should also be noted.

Contributing Factors.

Over 50% of the fires over $250,000 were outstandingly the result of inferior building construction. For instance, owners of highly valuable property subjected themselves to serious losses by the use of frame or frame, metal-clad wall, floor, and roof construction in 66 cases. In 69 of the other fires the construction was brick or stone with wood-joisted floors and roofs. In comparison with this type of construction, only 6 large loss fires occurred in fire-resistive type structures.

Several other construction features deserve special note. Wood-joist roof framing appeared in 127 of the 151 fires involving structures. Roof coverings were slightly better with 46 of the buildings involved having fire retardant roofing, 32 non-combustible and only 66 with combustible coverings. It is interesting to note that only one fire originated on a combustible roof.

Interior Construction Deficiencies.

The most grievous lack of interior protection evidenced by the large loss fires of 1946 was the lack of parapeted fire walls. This deficiency was noted in 81 separate fires with the result that the fire areas were excessive. In 64 cases failure to provide fire doors at horizontal openings was manifested by the reports, in 8 others fire doors were open or blocked, and in 5 more cases provision of a single door at the opening

or poor maintenance caused failure. Undivided attics permitting flames to extend just below the roofs and mushroom downward appeared in 9 cases. Undivided basements which often allowed flames to involve more than a single occupancy in a multiple occupancy building occurred in 7 specific cases out of the 151 fires involving structures.

Vertical Openings.

Unprotected vertical openings, stairwells and elevators, were reported in 77 cases. It is significant that in 61 of the fires, the flames used these natural "chimneys" to spread beyond control. Other influences upon the vertical spread of fire in the 90 multi-story buildings included in the large loss fires were unprotected vents and lack of fire stopping in concealed wall spaces. In 20 specific cases, flames traveled upward through inaccessible concealed spaces to complicate both automatic and manual fire suppression. In 8 cases, ducts for air conditioning systems and ventilation aided the vertical spread of fire.

Exposure Protection Considerations.

With 22 of the 187 fires falling into the group fire classification, it is particularly important to note that in 79 cases insufficient exposure protection was apparent. It is to the credit of the fire departments handling these major fires that more group fires or conflagrations did not result. Lack of window protection was specifically observed in 21 cases. In only one case was an outside sprinkler system provided and this stopped what otherwise might well have been a major conflagration.

Effect of Contents.

The high degree of flammability of contents played a major role in 102 of the 166 structural fires. Incipient fires starting in structures were fed by the contents to become major disasters even before the walls, floors, and roofs became involved. In 84 cases high concentration of stocks played a major role in the amount of the loss sustained, particularly in warehouses and mercantile properties. Congested stock conditions, inadequate aisles, and high piling featured in aggravating the losses sustained. Stocks subject to burrowing fires were involved in 20 fires, with cotton the most obvious example.

Private Protection.

Neither automatic sprinkler protection nor automatic fire detection systems were installed in 125 out of the 154 cases where such protection was applicable. This is 81% and as such is indicative of the lack of private protection which results in so much property destruction annually in the United States and Canada. How many of these large losses would have been minor with such protection installed may be estimated by the high efficiency records of such automatic protection facilities.

An unusually large number of these major fires of 1946 occurred in sprinklered or partially sprinklered plants. In 17 cases the protection was complete and in 8 more the sprinklers covered only a portion of the property. The large losses in sprinklered buildings were in most cases due to a combination of factors; the following includes all those involved:

Insufficient water supplies	13
System not properly designed for high hazard occupancy	9
Incomplete protection	8
Inadequate maintenance	8
Water shut off	7
Explosion wrecked system	3
Defective dry-pipe system	3
Obstructed distribution	3
Out of range under building	3
Poor distribution	2
Exposure fire	1
Frozen	1
Out of range in hollow wood walls	1
Out of range over roof	1
Partially closed valve	1

It is obvious that improper engineering of sprinkler systems and inadequate maintenance are largely responsible for the failures that did occur. Automatic protection must be designed to keep pace with the hazards protected, be provided with a sufficiency of water, and be constantly maintained in recognition that they are mechanical devices whose efficiency is only measured by their proper care.

Automatic alarm service was provided in only four cases where major losses were sustained. In one case, the alarm gave the local fire department the first notice of a fire in an adjacent yard which was so well advanced that little could be done to save the protected structure which lacked exposure protection. In the other three cases, the alarms operated properly to give first notice of the fires to the local fire department, but the nature of the contents and construction of the buildings permitted the fire to go beyond control of the protection facilities available.

Watchman protection was provided in 39 out of 90 cases where the plants were shut down, and failed to properly perform their duties in 19 instances. In 51 cases, no watchman was provided and detection was left to chance passers-by. Other employees were equally guilty of a common fault of watchmen — that of attempting to fight the fire before calling for fire department assistance. This happened in 26 instances among the 166 fires in buildings and structures.

Public Protection.

Without immediate notification of fire, even the best equipped and manned fire departments are severely handicapped in their job of rescue and extinguishment. Delayed discovery of fire was evidenced in 87 cases and delayed transmission of alarm in 117. The following table indicates who gave the alarm:

Automatic	4
Occupant or Employee	64
Explosion	19
Outsider	59
Police	2
Watchman	18

The means employed to transmit the alarms were predominantly by telephone, 105 cases. Street box alarms were only employed in 39 cases.

The fire departments were adjudged satisfactory in 100 cases, whereas in 59 cases they were considered weak. Mutual aid was required in 70 cases to handle the large fires. Insufficient equipment was noted in 46 fires, insufficient manpower in 34. No public fire protection was available to handle 7 of the fires.

Access to the base of the fire was made difficult by construction features, adverse winds, inadequate roads, or similar handicaps in 61 cases. Fire departments lacking previous experience in handling large fires were painfully evident in 20 instances and lack of pre-planning or familiarity with the properties frequent in many additional cases.

Causes.

In fires of the magnitude of those reported in this analysis, the cause of the fire is rarely available because of the extent of the damage and the destruction of evidence. In 104 out of the 166 structural fires, the cause is officially listed as "unknown." In 31 cases the cause is attributed to a common hazard and in 31 others special hazards. In the aircraft fires, 5 were occasioned while the aircraft were airborne, sixteen at time of ground impact.

Large Loss Fires of 1946.

Jan. 1, Greensburg, Ky. Warehouse—Tobacco. $325,000.

The large, frame ironclad Greensburg Tobacco Warehouse was totally destroyed by a midnight fire, the only possible cause for which was that it originated in one of ten trucks parked in the warehouse. The loose leaf tobacco alone amounted to approximately 300,000 pounds. Discovered by a watchman, the flames traveled quickly through the one-story, unsprinklered and undivided building, feeding on the highly combustible construction and contents.

The alarm was delayed as the watchman had to run 3 blocks to the fire station and by the time the town's one 500-gpm pumper reached the scene, dense smoke barred entry to the building. Three hose lines were laid from hydrants 250 to 800 ft. away (on a single 6-in. main), but the streams were wholly ineffective despite the efforts to get water on the contents by chopping holes in the one wall where approach was possible. Congested storage conditions, lack of proper aisles, and overloading with high valued tobacco leaf, trucks and wagons were other factors contributing to the high loss.

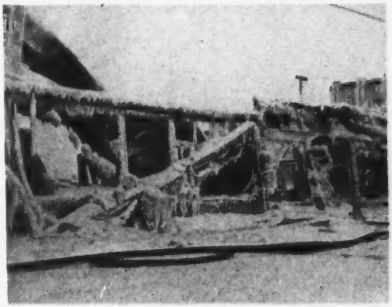
Jan. 2, Cicero, Ill. Group Fire—Industrial. $1,756,000.

Automatic sprinkler protection to the largely one-story Borin Art Products Company woodworking plant (picture frame manufacturing), and the large adjacent Western Auto Supply Company combination warehouse and retail store (total ground floor area approximately 114,000 sq. ft.) depended on a single source, 60,000-gal. gravity tank. On Dec. 26 this tank had been drained in order to repair leaking piping in the tank riser boxing. This followed accidental pipe freezing due to temporary shutdown in the woodworking plant caused by a strike. The work was not completed at 10:15 P.M., Jan. 2, when an explosion of unknown origin, followed by fire, occurred in the auto supply warehouse. When fire equipment reached the scene, flames were through the roof and spreading rapidly in both properties. Heat was also threatening an adjacent 2-story, concrete block and brick gear works, but the operation of 80 sprinklers (40 manually tripped) on an independent water supply system provided an effective water curtain to prevent extensive damage to this exposure except to the

International Soundphoto.

A strike idled this Cicero, Ill., plant and sprinkler pipes froze. Repair, delayed by the holidays, was not completed on January 2 when an explosion among flammable liquids in the adjoining store caused a fire destroying the 114,000-sq.-ft. building.

built-up roof covering and wood trusses. The fire was fought with public water supplies for 4 hours with 13 hose streams from 4 local pumpers and 6 others from Chicago. The hazard of delaying repair work on sprinkler systems, the necessity for providing more than a single source of water supply to sprinklers protecting high-valued, extra hazard occupancies and the importance of parapeted fire walls between large exposed areas were chief fire engineering lessons illustrated by this loss. The rapid spread of fire was attributed to a carload of alcohol, considerable amounts of cleaning fluid, and the storage of eight automobiles containing gasoline within the Western Auto Supply property. The loss included $862,000 property damage and $1,094,000 use and occupancy loss.



Acme.

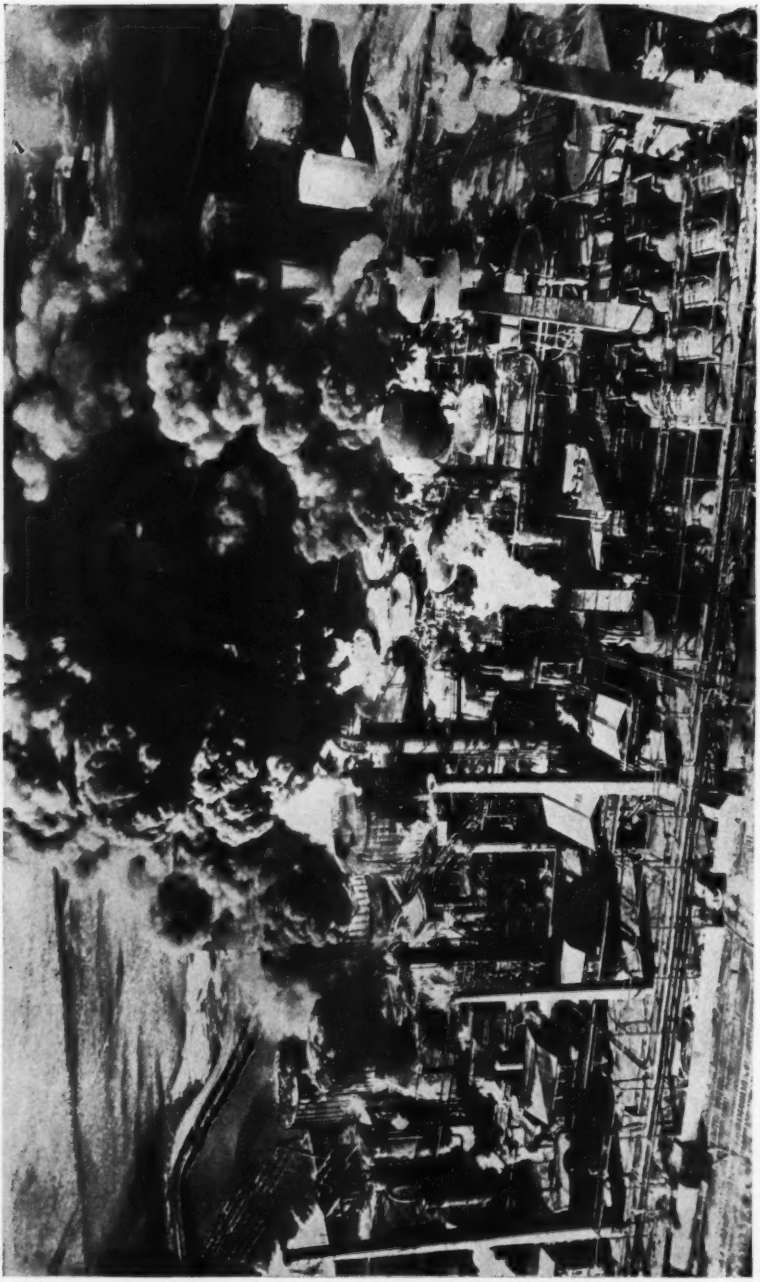
Sub-zero temperatures (—12°) complicated extinguishment of this mercantile group fire in Fairbanks, Alaska, Jan. 6.

Jan 6, Fairbanks, Alaska. Group Fire—Mercantile. $317,000.

No explanation could be given for a 7:30 P.M. explosion that blew out the front and back of a hardware store and resulted in fire that consumed 3 other unsprinklered, wooden mercantile buildings before being stopped. Lack of fire walls or doors allowed flames to spread with ease to these adjoining structures. Firemen, hampered by the below-zero temperatures, eventually stopped the spread of flames with

International News.

This Detroit factory building was heavily damaged on January 14 when a spark from an acetylene welding torch ignited a bale of rags.



Acme.

National Oil Refinery Company plant, Findlay, Ohio, Jan. 16, during disastrous fire which followed an explosion in an asphalt storage tank.

the help of high pressure fog dispensed from 2 Army crash trucks called from nearby Ladd Field. City firemen used 9 hose lines attached directly to 7 hydrants where pressure was maintained at 150 pounds by prearrangement with the central power plant.

Jan. 10, Columbus Twp., Pa. Tannery. $250,000.

The 1- to 3-story, largely frame, unsprinklered J. W. and A. P. Howard Company tannery was completely destroyed by fire originating in a hair dryer on the first floor of the main building. The plant was outside the city limits, and the only water available was from one dead-end, 6-in. main, which could provide at best only 2 or 3 hose streams. Smoke coming from the drier was reported to the plant superintendent by a night watchman. The former reached the plant quickly, found the fire considerably advanced and called the Corry Fire Department for assistance. Within 15 minutes the flames were out of control in the old building built in 1867. The fire burned itself out after destroying all of the main group of buildings except the hide house, carpenter shop and a frame barn, well detached.

Jan. 13, near Wichita, Kansas. Aircraft. Over $250,000.

Two company employees were killed when an experimental Model V Culver aircraft crashed from an altitude of only 100 feet after a power stall in flight. The accident resulted in an immediate fire when one of the pliocell fuel cells, located in the leading edge of the wing, tore open and spilled gasoline over the aircraft and surrounding area. The intensity and rapidity of the spread of flames made fire suppression efforts impractical, according to a company spokesman. The pilot was trapped in the aircraft and the observer, although successfully extricated, died of severe burns at the hospital. CAA investigators believed that the unconventional control system was either inadequate to compensate for gusts of wind, was poorly designed, or had become out of adjustment following a series of taxi-ing runs and low altitude flights. The airport is located 2 miles beyond the city limits.

Jan. 14, Detroit, Mich. Textile Worker. $250,000.

The block-long, one-story, brick, waste and auto padding factory of H. B. Hamburger Company was almost totally destroyed by an afternoon fire said to have originated when a spark from an acetylene cutting torch ignited a bale of rags. The first equipment to reach the scene found the fire so well advanced that flames were issuing from all parts of the building and the front wall was collapsing. Lack of a parapet on a fire division wall permitted the flames to spread over the roof and involve the entire 300 ft. by 100 ft. structure. Unprotected steel roof girders collapsed in the heat of the fire. A tacky aluminum paint which had been sprayed on the walls was reported as contributing to the rapid spread of flames in the unsprinklered plant.

Jan. 16, Findlay, Ohio. Oil Refinery. $500,000.

Details on the explosions and fire causing heavy damage to the National Oil Refinery Plant were published in the April 1946 QUARTERLY, pages 319 and 320.

Jan. 17, Linden, N. J. Oil Refinery. $350,000.

This fire in a fluid catalyst cracking unit at the Bayway Refinery of the Standard Oil Company (N. J.), was reported in the July 1946 QUARTERLY, page 72.

Jan. 17, Grand Anse, N. B. Church. $251,000.

A large, stone Catholic church, 124 ft. by 65 ft., was very heavily damaged by a fire believed caused by defective electric wiring. Absence of public fire protection, the advanced stage of the fire when it was discovered at noontime by a housekeeper in the neighboring parish house, and the fact that the church bell (normally used as a fire alarm signal) could not be reached, prevented saving any part of the building or contents. Only exterior stone walls remained standing, the iron roof (supported by wood framing) collapsing early in the fire.

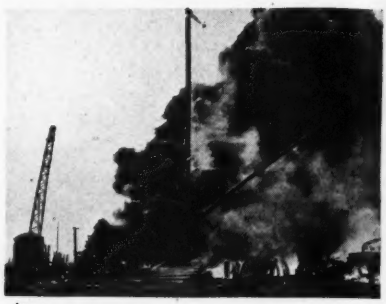
Jan. 18, near Cheshire, Conn. Aircraft. Over $250,000.

A gasoline leak caused by failure of a fuel line or connection in the vicinity of a fuel pump caused a fire in the left engine of an Eastern Air Lines plane, resulting in wing collapse and crash. Fourteen passengers and 3 crew members, the total number aboard, were killed as the aircraft struck ground in a wooded hillside. The fire was seen by ground observers, but apparently the crew had no knowledge of their plight until the wing failed, as there was no evidence of emergency procedures, no radio call for assistance, and the engine fire extinguishing system was not used. Local fire fighters and state police were quick to respond to the crash, but the fuselage was burned so completely that it was several hours before the bodies of the victims could be removed. New fire prevention regulations issued since this crash by the Civil Aeronautics Board will re-

quire fire-resistant fuel lines in the power plant and quick-acting fire detectors which will flash a warning to the pilot.

Jan. 21, Franklin Park, Ill. Creosote Treating Plant, $250,000.

A fire, preceded by three explosions, heavily damaged the Joslyn Manufacturing and Supply Company creosote treating plant and required almost 12 hours to extinguish. The blast apparently occurred in one of 3 buildings housing vats of creosote, and it is presumed that accumulated vapors were ignited by an electrical short circuit. Fire departments from 4 neighboring suburban towns fought the blaze, but inadequate water supplies curtailed the effectiveness of their efforts. One creosote storage tank blew up with such force that its 1500-lb. roof was thrown 300 feet.



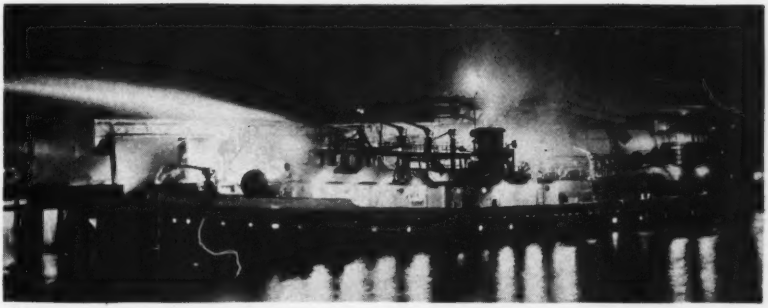
Acme.

The Joslyn Manufacturing and Supply Company treating plant was heavily damaged on January 21 by explosions and fires which originated in a building housing creosote vats.

Jan. 23, Brewer, Me. Textile Worker—Shoddy Mill. $500,000.

Inadequate private and public water supplies resulted in the destruction of the large, sprinklered, 4-story Striar Shoddy Mill from a fire said to have started on the third floor from foreign material in stock during picking operations. One employee was trapped and burned to death in the swiftly spreading flames and one other was badly burned. Employees were forced to flee when absence of pressure made attempts to use inside standpipe hose streams worthless. Two witnesses said the sprinklers (dry-pipe system) opened but that the water supply was not sufficient to cope with the

Foreign material in a picker was blamed for this fire in the Striar Shoddy Mill, Brewer, Maine, on January 23. Weak water supplies and poor maintenance practices combined to make ineffectual the dry pipe sprinkler system installed.



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Lack of sub-structure sprinkler protection and fire walls permitted flames to travel unchecked under two merchandise piers of the Baltimore and Ohio Railroad on January 25 at Staten Island, New York.

flames. There appears to be the possibility that a sprinkler valve was not fully open, denying the system of full supplies from the 530,000-gal. standpipe. Responding to the delayed alarm local fire fighters found flames were bursting from all sides of the structure, and it was necessary to request aid from Bangor, Dow Field and Orono. The public water supply (6-in. mains) was so inadequate that only 3 pumpers could be used, and the 75,000-gal. Brewer City water tank was quickly emptied. The entire city was without any water for almost 24 hours after the fire. This was the fourth in a series of recent fires where the same shortage of water had caused large losses. Approximately 1,500,000 pounds of new material waiting to be made into shoddy was destroyed. No insurance was carried.

Jan. 25, St. George, S. I., N. Y. Piers. $712,000.

Two merchandise piers of the Baltimore and Ohio Railroad, 2 annexes, freight cars, and floating equipment were destroyed or damaged by a fire originating under the freight platform of one of the piers. The fire was believed caused by discarded smoking material which became lodged between the wood decking. Automatic sprinklers, installed to protect pier sheds but not the combustible sub-structure, operated satisfactorily, but could not reach the origin of the flames. The first alarm (7:30 P.M.) was given by a railroad employee, working in the vicinity, who pulled the city alarm box. Twenty pumping engines, 12 hose trucks, 2 ladder trucks and 4 fireboats fought the flames throughout the night, as stiff, changing winds added to the difficult extinguishment problems. The main piers were 432 ft. long by 119 ft. wide and the annexes were approximately 150 ft. by 37 ft. Superstructure construction was corrugated iron-on-wood with wooden decks, flooring and roofs. Lack of fire breaks or walls in the pier structures permitted the fire to spread beneath the decking to the adjoining pier. It was also spread by radiation and flying sparks to the rolling stock, the combustible annex buildings and floating craft. Water supplies, beside the bay water, were from an 8-in. main fed by a 24-in. city main 600 ft. distant. The loss was divided as follows: buildings, $450,000; contents, $125,000; floating equipment, $68,000; cargo, $55,000; rolling stock, $14,000.

Jan 25, Jonquiere, Quebec. Group Fire—Mercantile. $485,000.

A warehouse, 7 stores and a theatre were destroyed by a sweeping fire which started at 8:20 P.M. in the furniture warehouse of the Legare Company. The cause of the fire is unknown, but arson is suspected after investigation proved that the heating system was not responsible as originally believed. Flames leaped across the main street after communicating to adjoining and adjacent structures, as local and mutual aid fire brigades fought vainly to stem the spread of flame with 20 hose streams. A 40-mile wind and extreme cold handicapped their efforts. The fire made homeless 80 persons and threw 75 out of work.

Jan. 26, Evansville, Ind. Warehouse—Military. $250,000.

A large, 2-story, wood-on-steel frame, unsprinklered warehouse at the Evansville Shipyards (under Navy jurisdiction) was heavily damaged by a fire believed caused by defective wiring. Reported by a watchman at 5:10 P.M., the fire had burned through the second-story floor when the shipyard fire department, 500 ft. distant, reached the scene. City assistance was requested, but its arrival was delayed when the equipment was routed to a far distant gate. Seven hose lines operating on pump pressure were used in an attempt to prevent spread of

Acme.

A frame unsprinklered warehouse at the Evansville, Ind., Shipyards burned on January 26 as city and Navy fire fighters battled to protect exposures.

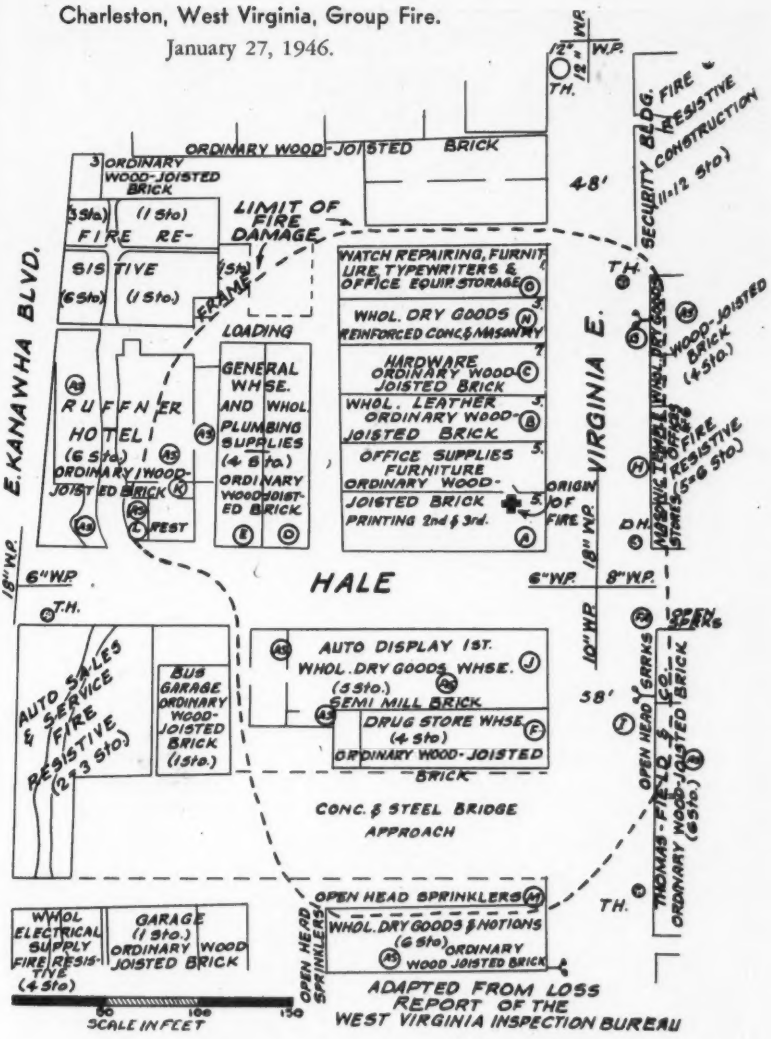
fire, but 3 other small buildings were damaged before help arrived. Large loading doors in the warehouse, which were nailed shut with spikes, also slowed the efforts of fire fighters to reach the base of the fire. The loss was $150,000 to building and $100,000 to contents.

Jan. 27, Picher, Okla. Group Fire—Mercantile. $300,000.

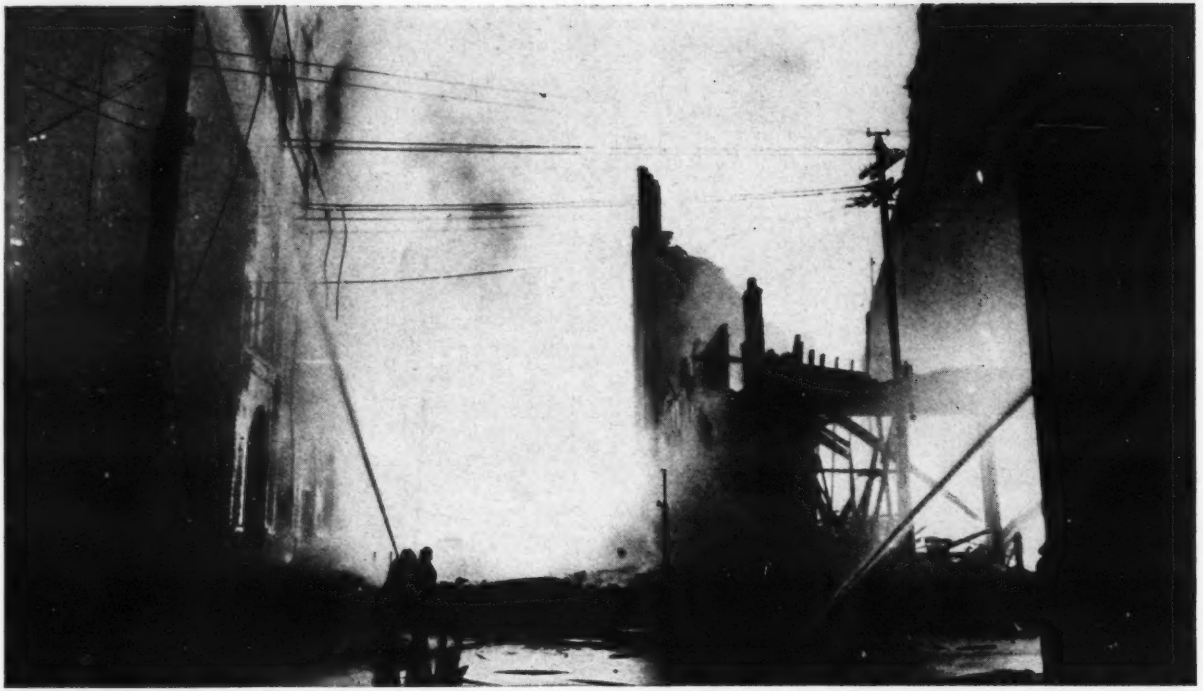
Half a block in the business district of Picher was destroyed by a fire which started in a tap room at 6:00 A.M. The building originally involved was an ordinary, brick-joisted, 2-story structure with apartments on the second floor. Flames spread to an adjacent theatre, then to a second tap room, a barber shop, drug store and a hotel. Fire fighters used heavy hand lines in fixed positions on the heart of the fire, and small streams to knock down the spreading flames. A high wind and freezing temperatures handicapped operations, but a heavy frost protected wood roofs in the vicinity from flaming embers.

Jan. 27, Charleston, W. Va. Group Fire—Mercantile. $1,000,000.

The magnitude which a fire, starting in a 5-story, unsprinklered, ordinary wood-joisted, brick mercantile building, can assume in a built-up business district was vividly illustrated in the Rose City Press group fire. Flames were first discovered by a passer-by at 3:29 A.M., and evidence indicates that they had had a considerable head start. Fire spread quickly from the building of origin (See A on diagram, page 189) to 2 adjacent 5- and 7-story (B and C), ordinary wood-joisted, brick mercantile buildings, jumped an 18-ft. alley and involved 2 other similar 4-story structures (D and E) and leaped a fire-resistive, sprinklered building 5 stories high across a street 42 ft. wide to involve a fifth wood-joisted, brick, 4-story warehouse (F). These fires were beyond control by 4:00 A.M. Small fires had meanwhile started in 2 (one sprinklered) buildings (G and H) across a 58-ft. street, diagonally across the intersection of 2 main avenues in 2 other protected buildings (I and J) and 2 additional exposed sprinklered properties (K and L). About 5:00 A.M. fire was found to have involved a still more distant sprinklered building (M), 175 ft. from the original building, also to have entered one fire-resistive structure (N) and one other building (O), the latter two being adjacent to the properties originally involved. The undermanned fire department had all available equipment and manpower (54) in service in the shortest possible time and a minimum of 15 hose lines in service. The water supply was ample at all times with hydrant pressures estimated at 93 lbs. Automatic sprinklers on the outside of the building of the Thomas Field & Company (I) were most effective, while 6 heads which operated in building "M" and 35 in building "J" limited interior damage to minor loss. Sprinklers were not needed inside building "G" as damage was confined to window glass and blinds. Loss in sprinklered buildings "K" and "L" was somewhat heavier due to water damage and collapse of building "E." Those buildings (6) having sprinkler protection incurred damages of approximately $30,000, while unprotected buildings (8) suffered damages of approximately $730,000 according to preliminary and partial loss figures. The entire loss was estimated to be about one third of the sound value of the buildings and contents involved.

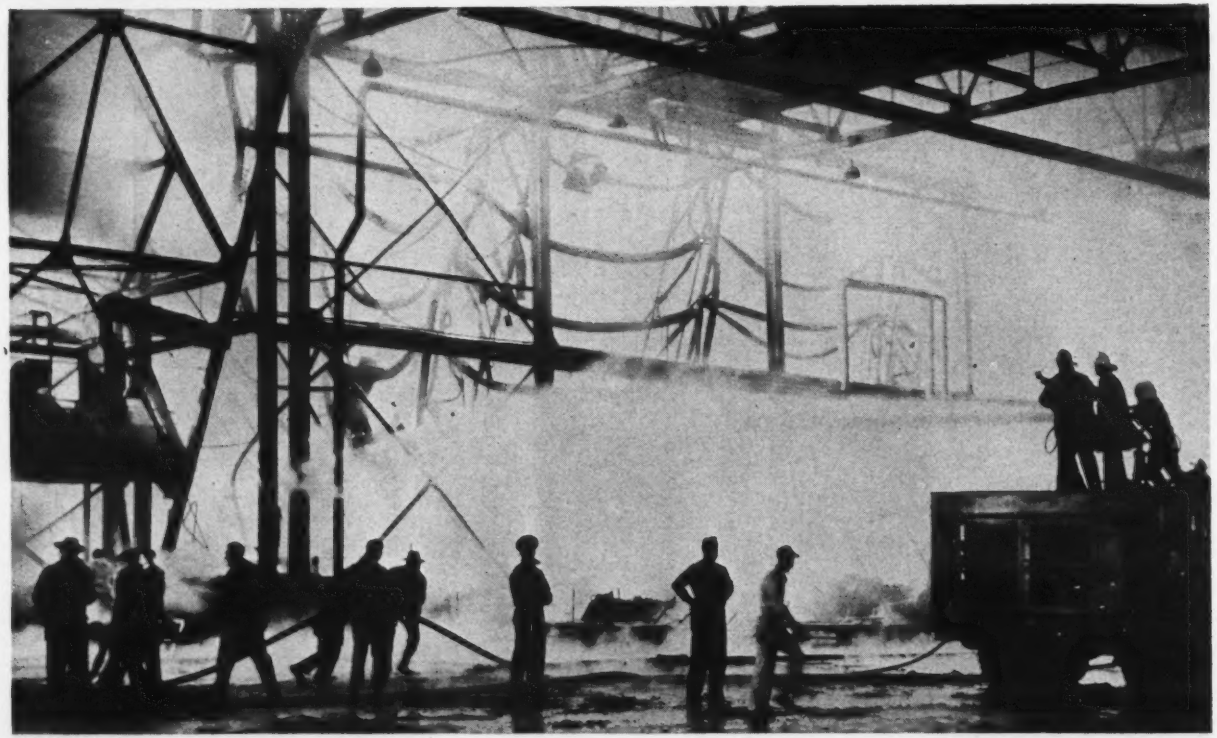

Charleston, West Virginia, Group Fire.
January 27, 1946.
E. KANAWHA BLVD.
VIRGINIA E.
HALE
LIMIT OF FIRE DAMAGE
ORIGIN OF FIRE
ORDINARY WOOD-JOISTED BRICK
FIRE RESISTIVE (6 Sto.)
(1 Sto.)
LOADING
RUFFNER HOTEL (6 Sto.)
ORDINARY WOOD-JOISTED BRICK
REST
GENERAL WHSE. AND WHOL. PLUMBING SUPPLIES (4 Sto.)
ORDINARY WOOD-JOISTED BRICK
WATCH REPAIRING, FURNITURE, TYPEWRITERS & OFFICE EQUIP. STORAGE
WHOL. DRY GOODS REINFORCED CONC. & MASONRY
HARDWARE ORDINARY WOOD-JOISTED BRICK
WHOL. LEATHER ORDINARY WOOD-JOISTED BRICK
OFFICE SUPPLIES FURNITURE ORDINARY WOOD-JOISTED BRICK
PRINTING 2nd & 3rd.
SECURITY BLDG. FIRE RESISTIVE CONSTRUCTION (11-12 Sto.)
WOOD-JOISTED BRICK (4 Sto.)
FIRE RESISTIVE (5-6 Sto.)
OPEN SPACE
AUTO SALES & SERVICE FIRE RESISTIVE (2-3 Sto.)
BUS GARAGE ORDINARY WOOD-JOISTED BRICK (1 Sto.)
AUTO DISPLAY 1ST.
WHOL. DRY GOODS WHSE. (5 Sto.) SEMI MILL BRICK
DRUG STORE WHSE. (4 Sto.) ORDINARY WOOD-JOISTED BRICK
CONC. & STEEL BRIDGE APPROACH
OPEN HEAD SPRINKLERS
WHOL. DRY GOODS & NOTIONS (6 Sto.) ORDINARY WOOD JOISTED BRICK
THOMAS-FIELD & CO. ORDINARY WOOD-JOISTED BRICK (6 Sto.)
WHOL. ELECTRICAL SUPPLY FIRE RESISTIVE (4 Sto.)
GARAGE (1 Sto.) ORDINARY WOOD JOISTED BRICK
SCALE IN FEET
ADAPTED FROM LOSS REPORT OF THE WEST VIRGINIA INSPECTION BUREAU

This plan of the Jan. 27 fire in Charlestown, W. Va., should be read with the text story for proper understanding of the contributing factors.



Acme.

A sweeping fire gutted 8 unsprinklered multi-story mercantile buildings and damaged 6 sprinklered structures in Charlestown, W. Va., on Jan. 27.



Press Association.

Fire fighters used high pressure fog from AAF crash trucks to extinguish this hangar fire at Tinker Field, near Oklahoma City on January 28.

Jan. 28, Hopewell, Va. Dry Cleaning Plant. $420,000.

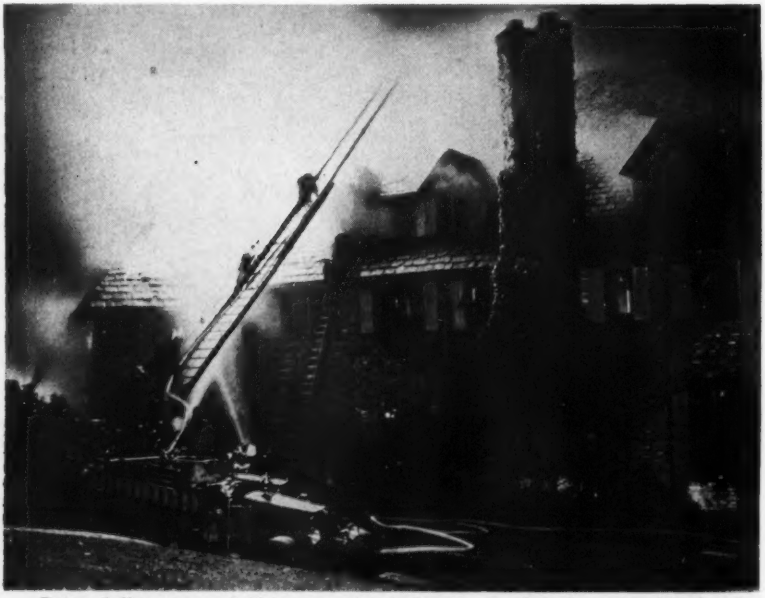
A fire which destroyed the plant of the Victory Cleaning Company shortly before 8:00 A.M. originated from an explosion in a dryer tumbler. The one-story brick building was one large area and lacked fire division walls or automatic protection of any type. Flames spread rapidly to other tumblers, fed by flammable dry cleaning solvents. The blaze was extinguished only after local and nearby military fire departments battled for more than 3 hours. Loss was said to include $250,000 for military clothing being cleaned; $150,000 for equipment; $20,000 damage to the building.

Jan. 28, near Oklahoma City, Okla. Hangar—Military. $2,300,000.

An electric heater coil which ignited gasoline fumes escaping from a broken hose connection on a fuel booster pump test stand started a fire which swept a large AAF aircraft maintenance hangar at Tinker Field and resulted in the death of 10 persons. Those killed were trapped on a mezzanine floor directly over the fuel pump test department. Only one exit was provided and this was blocked by flames. The hangar involved (200 ft. by 283 ft., and 90 ft. high at arch center) adjoined a similar hangar, a large shop area 350 ft. by 675 ft., and 2 other hangars of like description on the far side of the shops. The entire area (approximately 13½ acres under one roof) was without fire stops, but fire fighters were able to bring the blaze under control by entering the shop area and driving the flames back with high pressure water fog while other hose streams were played on the corrugated metal and glass walls from the outside. Unusual dangers accompanied the fire-fighting operations as unprotected structural steel roof framing buckled and twisted from the heat, but fortunately did not totally collapse except along one wall. No automatic sprinklers were installed at the time of the fire, although projects had been submitted for such protection by Army Air Force authorities in recognition of the fire danger. Failure to provide fire cutoffs for special hazard operations was another obvious deficiency. The loss was divided $500,000 for structural damage; $1,800,000 for contents.

Jan. 30, Washington, D. C. Dwelling. $750,000.

Valuable paintings were destroyed and severe structural damage occasioned by a fire in the Guggenheim mansion in suburban Washington. (See April 1946 QUARTERLY, page 325.)



Delayed discovery and distance to five hydrants were largely responsible for the large fire loss sustained in the Guggenheim mansion, Washington, D. C., January 30.

Acme.

Unprotected window openings plus lack of sufficient distance between buildings permitted flames to involve a large portion of the Globe-Bosse-World Furniture Corporation plant at Evansville, Ind., on January 31.

Jan. 30, Peekskill, N. Y. Group Fire—Mercantile. $250,000.

Peekskill's worst fire in 18 years heavily damaged 4 stores and a restaurant. More than 200 firemen from the local department and 5 other communities fought the fire for 6 hours before it could be brought under control. The fire was reported at 6:04 P.M. Evidence indicates it started in the rear of a clothing store and spread through the 3-story, ordinary wood-joisted, brick building to involve 4 other adjacent and similarly constructed buildings. Professional and business offices on upper floors were also gutted. Outside help was secured through the Westchester Fire Chief's Emergency Plan organization.

Jan. 30, Riggins, Idaho. Woodworker—Saw Mill. $250,000.

A new saw mill, completed in December, 1945, was burned to the ground by a fire of undetermined origin. The blaze was discovered by a watchman at 6:30 P.M., and early attempts to quell the fire failed. Flames, which volunteer fire fighters of this small community could not control, swept the property. Of frame construction, the main building (40 ft. by 120 ft.), a machine shop, engine room and boiler room were lost. The mill had been designed for a daily capacity of 40,000 ft. and some 4,000,000 ft. of logs were on hand for cutting. Finished lumber piled in an adjacent yard was saved because of the favorable direction of the wind.

Jan. 31, Evansville, Ind. Woodworker—Furniture Factory. $562,000.

A large portion of the sprinklered furniture plant of the Globe-Bosse-World Company was destroyed by a fire which started from an explosion (of unknown origin) in either a fire-resistive, unsprinklered, dry kiln or in an adjoining brick-joisted, sprinklered kiln. The force of the explosion communicated the flames, issuing from a forced door, to a transfer and lumber shed equipped with a dry pipe sprinkler system without accelerators or alarm connections. The first alarm transmitted was from a city alarm box at 11:39 A.M., four minutes after the fire was discovered by an employee. A strong wind fanned the flames in the building of origin, and it was apparent that the fire went beyond possible control of the sprinklers, either because of the explosion, their delayed operation (absence of accelerator), or the large quantity of flammables immediately involved. Sprinklered buildings on three sides were immediately exposed, and the fire, urged on by the wind, spread to a frame, one-story 60 x 70 ft. lumber shed (25 ft. distant), to a 2-story, brick-joisted, 400 ft. x 60 ft., machine woodworking building (20 ft. distant), and to a maze of other two- and three-story interconnected buildings (almost totally sprinklered) covering a general area of approximately 300 ft. x 250 ft. (30 ft. distant). The fire apparently entered these buildings through unprotected windows and wood roofs. Hundreds of

Press Association.

Absence of automatic protection, stairwell enclosures, and fire division walls combined with frame construction to give flames free access to the Charleston (S. C.) recreation hall at the Naval Base on January 31.

sprinklers opened and the single source water supply from a 12-in. main was severely taxed. Hose lines also reduced the volume and pressures fell to approximately 20 lbs. p.s.i. at the height of the fire. Intense heat prevented placing a pumper line on the single fire department connection, and only superior fire fighting saved other portions of the plant seriously exposed across a 75 ft. wide railroad spur and street. Sprinkler failure is attributed to the following combination of factors: the explosive origin of the fire, the lack of an accelerator on the dry-pipe system, the large number of heads that opened simultaneously with spread of fire to inadequately spaced exposed buildings, the overtaxing of the single source water supply available, and the inability of the fire department to connect a pumper line to the sprinkler system.

Jan. 31, Charleston, S. C. Recreation Hall. $940,000.

A fire originating near an open stairway heavily damaged a large, 2-story, frame, unprotected recreation hall at the Charleston Naval Base. Absence of automatic protection, stairwell enclosures, and fire division walls combined with frame building construction to give the flames free access to the structure and its combustible contents. Naval Base, municipal and county fire fighters fought the blaze from the time it was first reported by an occupant at 3:00 P.M. until well after dark. The building housed a motion picture auditorium, library, bowling alley, gymnasium, billiard and pool rooms, soda fountain and similar entertainment facilities, plus offices for recreation and welfare services.

Feb. 1, near Charleston, S. C. Chemical Plant. $294,000.

The 24,000-sq.-ft., frame, sulphuric acid chamber building of the A. F. Pringle & Company's fertilizer factory was destroyed by a fire believed caused by ignition of wood roof framing from sparks emitted by the boiler stack of a nearby saw and planing mill. The plant, located 1,200 ft. outside city limits, had a private looped hydrant system supplied by a 6-in. metered connection from the 24-in. city main, and a 1,000 gpm pump taking suction from a 250,000-gal. reservoir. Fire equipment was summoned by a central station alarm from 2 local parishes and from Charleston. Despite prompt arrival of the fire departments which used 6 pumpers in applying hose streams, the fire, largely inaccessible to ground hose lines, burned down through the roof and spread throughout the large unbroken area of the building. The heat soon weakened the lead acid chambers, and 1,300 tons of sulphuric acid ran out on the earth floor. This resulted in the destruction of a large amount of the private and municipal hose lines being used on the fire. Almost all of the acid chamber building was destroyed but an adjoining tower building was saved, thanks to a parapeted fire wall with all openings protected by double fire doors. Loss is divided $41,000 to buildings; $88,000 to machinery; $15,000 to sulphuric acid and other stocks; and $150,000 for use and occupancy.

Feb. 1, Saskatoon, Sask. Warehouse—Farm Machinery. $250,000.

The 38,100-sq.-ft. brick warehouse of the J. I. Case Company, lacking automatic sprinklers, was heavily damaged by a fire which originated in a wood partition covered with building paper. This partition was 18 inches from a stove constructed of four oil drums capable of burning logs in 4-ft. lengths. Only protection afforded the partition against ignition from radiant heat was a metal shield one foot from the stove and 6 inches from the partition. Flames traveled from this point to involve the structure, owing to open exterior doors and an open fire door in the only brick subdivision of the one-story building. Firemen fought the flames with 6 hose streams in temperatures varying from 27° below zero to 15° below. The alarm was given promptly by a

Open fire doors in a single fire division wall permitted flames to heavily damage the J. I. Chase Company warehouse in Saskatoon, Sask., on February 1. Temperatures at the time hovered between 15° and 27° below zero.

Elkhart Truth.

Delayed discovery allowed fire to destroy a block of mercantile buildings in Syracuse, Ind., on February 2.

company employee when the fire was discovered, but it probably had been burning for some time before the 10:07 A.M. call. In addition to farm machinery, Army ordnance supplies had been stored in the building.

Feb. 1, Crimora, Va. Chemical Plant. $250,000.

Absence of automatic sprinklers, frame construction, and lack of public protection resulted in the loss of the Central Chemical Corporation's large plant. The spectacular fire was punctuated by explosions of sulphur, and the flames were visible for miles. Volunteer fire fighters from surrounding communities could only save adjacent structures. Water was pumped in relays from a river 6,000 ft. away—the sole available source. Discovered by employees at 5:15 P.M., the fire was caused by an electrical short circuit in an elevator shaft and communicated through unprotected openings to all parts of the 2-story structure.

Feb. 2, Syracuse, Ind. Group Fire—Mercantile. $500,000.

A theatre, cocktail lounge, art gallery, bowling alley, newspaper plant, and 6 apartments were wiped out by a fire which totally involved the Pickwick block of mercantile buildings. The fire was discovered at 4:40 A.M. by tenants of one of the apartments. A stiff wind fanned the flames as firemen from 8 communities attempted to halt the advance. The city's water supply was exhausted by the demand, and water had to be drafted from a nearby lake. A second blaze, which broke out in the ruins after the day-long fight, destroyed the scattered unburned portions of 2 stores.

Feb. 3, Chicago, Ill. Hotel. $281,000.

Four fires within 12 hours, 3 probably attributable to careless smoking, caused considerable damage to the 1,000-room, 14-story, unsprinklered, old, fire-resistive type Congress Hotel. One guest was suffocated. Wood trim, open stairways, and drafty corridors were contributing factors in the spread of two of the fires. Delayed alarms also featured in 2 of the 4 fires, as employees unsuccessfully fought the flames with hand appliances before calling the fire department. In all, fire gutted 33 guest rooms and smoke and water damaged 60 others. Loss to the building was set at $113,000; to contents, $30,000; and the use and occupancy loss amounted to $138,000.

Feb. 8, Ancienne Lorette, Que. Woodworker. $559,000.

A 430 ft. by 230 ft. aircraft hangar at the Ancienne Lorette Airport was destroyed by fire while tenanted by a manufacturer of prefabricated houses. Flames were first observed by employees about 11:25 A.M. near a hot air grate in a tool room. The airport brigade immediately requested help from Ancienne Lorette and Quebec city as flames threatened exposed structures. A favorable wind and a water screen saved the other structures and heavy aircraft parked nearby. Little could be done to extinguish the flaming hangar because of the quick-burning contents (including lumber stock, sashes, doors, and other building supplies) and the height of the building. Sawdust on the rafters, 15 drums of Diesel oil, tar paper, and a truck contributed to the rapid spread of fire. The water supply was a 150,000-gal. reservoir, which was practically exhausted after 8 hours of fire fighting.

Feb. 11, Clinton, Mo. Hatchery. $500,000.

Lack of adequate water through a 4-in. dead-end main, plus an undivided large area building were the chief factors responsible for the total loss of the Bush Chicken Hatchery. Starting in the office at 3:00 A.M., the fire was discovered by a watchman. Possibly half an hour elapsed, however, before the alarm was given, as an attempt was made by employees to extinguish the fire. When reported, someone drove to the fire station to give the alarm. The hatchery (rated as one of the largest in the country) was a one-equals-two-story building of brick and tile-faced, wood-joisted construction, covering almost an acre of ground. The loss figure given above is the most reliable estimate available and is based on the owner's estimate of his loss of chicks, eggs, and incubators, plus all records (which were destroyed in their filing cabinets) and the structure.

Feb. 13, Chicago, Ill. Warehouse—Terminal. $550,000

Employees at the Jones Transfer Company attempted to extinguish a fire caused by a defective oil burner until the fire was out of control. When the fire department reached the scene at 9:35 P.M., flames had communicated through unprotected wall openings and corrugated steel partitions for a distance of 1,000 ft. from the place of origin. An unsprinklered paper storage warehouse, a freight loading platform, and a steel and wire manufacturing plant were involved. Three exposed sprinklered buildings, one safeguarded by a well-parapeted fire wall, were only slightly damaged. Hose lines were required to protect some ordinary window openings in other exposed properties. Fire equipment dispatched to the scene numbered 35 engine companies. Thirty-three 2½-in. and 3½-in. hose lines were used. High winds, falling snow, and below-freezing temperatures handicapped fire-fighting operations.

Poor sprinkler system maintenance, unprotected, open, below grade areas, and inferior construction with poor upkeep were chief factors in the Spartanburg Warehouse fire on Feb. 13.

Feb. 13, Spartanburg, S. C. Warehouse—Cotton. $250,000.

Fire got a critical head start in a sprinklered, frame cotton warehouse since it originated in an unsprinklered open space beneath the ground floor (grass surfaced), and spread rapidly into the building through cracks in the wood flooring and side walls. Sprinklers operated properly but could not reach the base of the fire, especially because of the congested storage conditions and the high water-absorption of the cotton bales stored in the building. In all, four compartments of the 3-story Spartanburg Bonded Warehouse were destroyed. The first alarm was telephoned to the city department at 5:04 P.M., but response was delayed 10 minutes by a misunderstanding as to the location of the property involved. By the time fire fighters reached the scene part of one compartment had already collapsed and the other three sections were totally involved. At the height of the blaze, 7 or 8 hose streams were in use in an attempt to confine the spread and a parapeted fire wall materially aided in saving some 6,000 other bales in adjoining compartments.

Feb. 15, Lexington, Ky. Warehouse—Miscellaneous. $340,000.

A 10:00 P.M. fire totally destroyed a large, 2-story, brick storage and service building operated by the University of Kentucky. Starting in the basement, flames traveled throughout the unsprinklered building (formerly a tobacco warehouse), through open stair shafts and undivided floor areas. The building was being used for miscellaneous storage, including the garaging of 15 trucks and the storage of maintenance implements, a tank of gasoline, and 25 barrels of oil. It also contained such services as a carpenter shop, paint shop, plumbing and electrical shops, office and janitorial supply storage, and lumber storage. Evidence indicates that the fire started in a truck in the basement. Fire fighters found the entire building (275 ft. long) involved when they arrived after a telephone alarm by a chance occupant, and were compelled to concentrate all efforts toward saving exposed properties, including a large tobacco redrying plant and the University's central heating plant.

Feb. 16, Brooklyn, N. Y. Warehouse—Terminal. $1,000,000.

The one-story, unsprinklered, frame, Smith Bay Corp. warehouse (200 ft. by 175 ft.), was totally destroyed by a fire which burned for 3 days before final extinguishment. The night watchman who discovered the fire at 6:53 P.M. summoned fire equipment from a nearby street alarm box. Response included both land pumpers and 2 fireboats which used an adjacent canal. It was obvious to fire fighters that the flames had a considerable head start, were being fed by highly combustible contents, and that the spread was being aided by the 50 mph winds. Two additional alarms and four special signals were sounded at intervals until 7:32. The warehouse was being used for the storage and packing of all types of material in waterproof wrappers and wood crates for overseas shipment. In all, 15 customers' goods were on the

Press Association.

Only an unpierced fire wall in the Montgomery Ward store stopped this fire which started in the basement of the Hardy Department Store and swept through five old-style unsprinklered mercantile buildings in Muskegon, Mich., on Feb. 22, 1946. **(See page 200.)**

premises, some of these having no insurance coverage. The loss to the building was under $20,000, with the balance on the contents.

Feb. 16, Jamaica, N. Y. Mercantile—Multiple Occupancy. $250,000.

The Rapoport and Eller paint and wallpaper shop, the Singer Sewing Machine Company store, and a men's furnishings store (all sharing a single mercantile building) were completely destroyed by a fire of undetermined origin first discovered at 7:45 A.M. by an outsider. Water and smoke damage was also sustained by 2 adjoining furniture stores. The raging flames snarled traffic in the Jamaica shopping district until noon, and heavy smoke from burning paints blanketed the area. Two firemen were injured when a ceiling collapsed, and 4 others were treated for smoke poisoning.

Feb. 19, Shawinigan Falls, Que. Group Fire—Mercantile. $250,000.

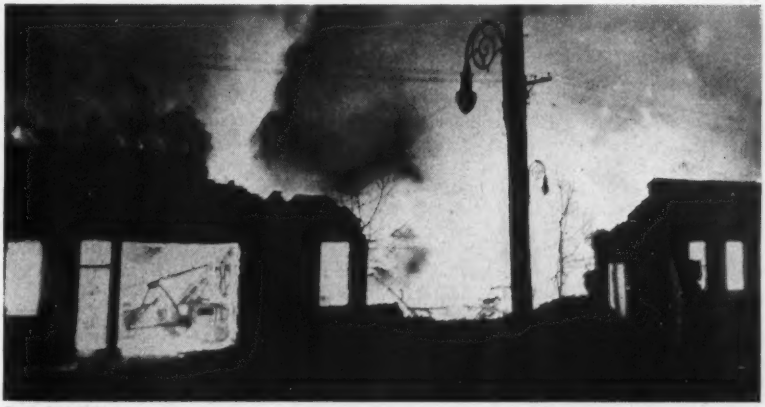
Three mercantile buildings were destroyed and a fourth damaged when a fire, believed caused by a furnace explosion in a multiple-occupancy retail store building, spread out of control during the early morning hours. Passers-by gave the alarm and fire fighters fought the blaze in sub-zero weather to prevent what threatened to become a major conflagration.

Feb. 20, Manchester, N. H. Textile Worker. $522,000.

A plumber used a welding torch on the team pipe to a unit heater on the fourth floor of the 4-story, brick, Amoskeag Lawrence Textile Mill. A spark ignited one of about 1,102 bales of cotton waste stored in the immediate vicinity, and although a fire guard was at hand with a carbon dioxide fire extinguisher and 2 fire pails, a fire beyond control of such equipment flashed over the bales. Automatic sprinklers operated promptly and would undoubtedly have been effective had it not been for premature closing of the valve by an unknown person. The fire chief of the city department ordered the sprinkler protection immediately restored upon his arrival. An excellent delivery was secured from 81 heads. Six hose streams were also used on the fire, and some 450 bales of smoldering cotton waste were thrown out of the windows. The building was one fire area, 534 ft. by 103 ft., and while the structural damage was light, water damage to contents on the fourth and all lower floors was exceedingly heavy.

Feb. 20, Campbellton, N. B. Metalworker. $325,000.

Nine buildings of the sprinklered, frame and metalclad McLennan Foundry and Machine Works were totally destroyed by fire originating from an unknown cause in a storage building for bar iron. Evidence indicates that the dry valve for the sprinkler system (installed in 1916) tripped properly, but that simultaneously a break occurred in the 4-in. main supplying the system. The sprinklers in other buildings were similarly supplied through the single dry-pipe valve and the break in the main so reduced the pressure that an adequate discharge



Press Association.

Using a former unprotected tobacco warehouse for a miscellaneous warehouse and service building proved poor economy when fire started in the basement and destroyed the entire structure on February 15 in Lexington, Ky.

could not be secured. Water supplies were almost totally knocked out when the wood gravity tank mounted on a steel tower ignited and collapsed during the early stages of the fire. Falling debris from the gravity tank severed 2 hose lines being used by fire fighters and broke the sprinkler piping in nearby buildings. When the underground valve connecting the town mains to the plant sprinkler system was finally closed, better pressures and volumes on public hose streams were secured. By this time, however, the fire had advanced beyond control of available municipal fire suppression facilities. The foundry was located in a difficult place for approach by fire equipment, and the pumper had to be located 2,000 ft. from the fire. A passer-by originally discovered the fire as the watchman was busy extinguishing another incipient blaze in the moulding shop. Instead of turning in an immediate alarm, the observer first notified the watchman, whereupon both ran to a street alarm box to summon the fire department. The dollar loss was 90 per cent on contents, with insurance coverage limited to $135,000.

Feb. 22, Muskegon, Mich. Group Fire—Mercantile. $2,000,000.

Five, old-style, brick, wood-joisted, 2-and 3-story, unsprinklered mercantile buildings were destroyed by fire despite the effective operation of a central station automatic fire alarm system in the building of origin. A watchman also heard the local alarm at 8:57 P.M. and, pending arrival of fire fighters, battled the flames in baled paper in the basement of the Hardy Department Store with a standpipe hose until forced to withdraw because of heat and smoke. The fire spread out of control to upper floors through open stairways and partially open elevator shafts. The building of origin was heavily charged with smoke when fire fighters arrived, and the rear wall collapsed in about 35 minutes. Flames entered unprotected window openings, spread over the roofs, and through weakened division walls to involve other exposed structures. A fire wall on one newer type sprinklered building finally stopped the flames (with the aid of hose streams), but not until the group of old buildings was a total loss. An office supply store, some clothing stores, two jewelries, a shoe shop, drug store, offices and apartments were wiped out. One fireman was injured when he was hurled to the pavement by a hose stream in contact with high tension wires. Two paid and 2 volunteer fire departments answering the alarm used a total of 23 hose lines. Direct fire loss: $886,000; insurance loss (including business interruption and rental value): $2,000,000. (See photo p. 198.)

Feb. 25, Atlanta, Ga. Rubber Storage. $350,000.

Fire of undetermined cause occurred in scrap rubber in the yard of the Dixie Rubber Products Company. A central station automatic fire alarm system in exposed buildings brought fire equipment to the scene at 4:30 P.M. Final extinguishment was not completed until the afternoon of the 27th. The flames first extended to a 4-story, brick-joisted warehouse (8,000-sq.-ft. ground floor area) and were heightened by explosions of drums of rubber cement. Three other large, 4-story buildings were also destroyed and one damaged. The fire illustrated the danger of congested storage of worn tires and chopped scrap rubber in a yard area without adequate aisles or clear space from buildings. Fire fighting was handicapped by dense clouds of smoke. Twenty pumpers and 35 hose streams were used during the fire.

March 1, Watertown, Wis. Malt House. $293,000.

Fire destroyed an old 5-story malt and kiln house and adjoining structures of the Fleischmann Malting Division of Standard Brands, Inc. (See July, 1946, QUARTERLY, page 55.)

Heavy damage was sustained by this malt house of the Fleischmann Division of Standard Brands in Watertown, Wis., on March. 1.

March 1, Washington, D. C. Bowling Alley. $265,000.

A fire totally destroyed the bowling alleys on the top floor of the large, 70-year-old Convention Hall Market building. Fire was not discovered until flames came through the arched roof of the 3½-story building. This roof was steel truss with wood-joisted framing and metal roof covering. Five alarms were sounded soon after 2:45 A.M. to bring all available fire equipment to the scene. The huge roof collapsed, but a concrete-on-corrugated-metal floor, supported by steel columns, prevented any but trivial damage to the ground floor below. The large undivided area had 50 bowling alleys.

A yard fire of scrap rubber extended to five buildings before being controlled in Atlanta, Ga., on February 25. Failure to provide clear spaces around structures was an obvious shortcoming.

March 2, Fabens, Texas. Warehouse—Cotton. $812,000.

The combination of an untrained watchman and untrained volunteer fire fighters, plus failure to provide under-floor sprinklers, resulted in the loss of a 61,800-sq.-ft. frame, metal-clad, sprinklered, cotton compress-warehouse, including approximately 5,000 bales of cotton. Flames were first discovered by the watchman about 11:45 P.M., coming from a 3 ft. high unsprinklered space under the ground floor of the El Paso Valley Compress Company building. After an unsuccessful attempt to open a valve controlling a standpipe fire hose, the watchman

Press Association.

Occupied as a 50-alley bowling area, the top floor and roof of the Convention Hall market building in Washington, D. C., was destroyed by a fire of unknown cause in the early morning hours of March 1. (See page 200.)

ran 500 ft. to the home of a maintenance man. When the two returned, fire had extended to the south wall of the building, some 100 ft. from where it was first noticed. An unknown party called the volunteer fire department at 12:04 A.M. One fire fighter testified that 3 complete rows of sprinklers were operating when he reached the scene and were successfully confining the flames. However, ineffective use of eight 2½-in. hose streams soon exhausted the private water supply. No one at the scene knew enough about the valve system to shut off the particular portion involved. The loss was divided $212,000 to buildings and contents (excluding cotton) and $600,000 for cotton alone.

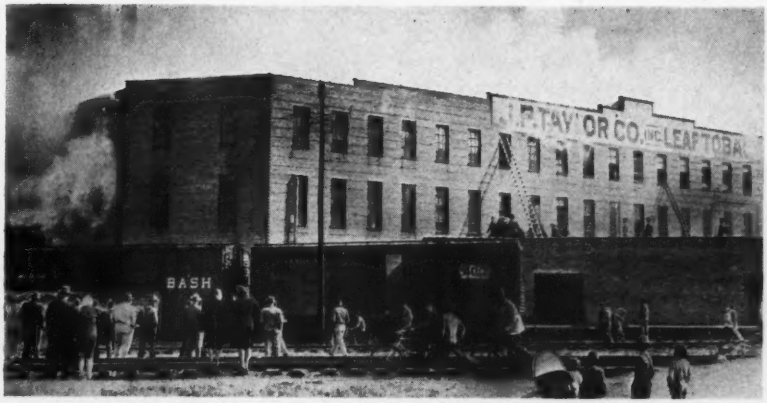
March 2, Goldsboro, N. C. Tobacco Rehandling Plant. $350,000.

Fire, originating on the second floor of the 3-story J. P. Taylor Company tobacco rehandling plant (constructed of brick walls and plank-on-timber flooring), destroyed the top 2 floors and resulted in heavy water damage to tobacco and machinery on the first floor. The cause of the fire could not be determined. The plant had been closed for the weekend and 2 hours before discovery of the fire, janitorial personnel had left the building after sweeping the floors and oiling the machinery. The section involved in fire was unprotected by either sprinklers or an automatic alarm system. Although a watchman was on the premises and had started his rounds, the first warning of fire came from a passer-by, who saw smoke coming from second floor windows.

The fire department responded promptly, but were unable to gain entrance because of the thick smoke. One pumper was delayed half an hour in laying hose when a switching engine, in its haste to pull freight cars to safety, jumped the tracks. Another serious delay resulted when the 1,000-gal. pumper broke down and had to be replaced. Occurring just when firemen had gained control of the flames, this loss of water allowed the fire to gain the upper hand again and prolonged fire fighting 4 more hours. Losses were divided $134,000 to building; $137,000 to contents; $79,000 to stock.

March 3, near Memphis, Tenn. Warehouse—Military. $250,000.

A "temporary" unsprinklered frame warehouse and shop (33,600 sq. ft. in area) at the



Discovered by a passer-by fire of unknown cause had a considerable head start before fire fighters reached the scene in this tobacco rehandling plant in Goldsboro, N. C., on March 2.

U. S. Army Service Forces Depot was destroyed by a fire discovered at 7:10 P.M. by a guard at a gate 100 yards away. Flames were coming through the roof as Army equipment reached the scene and help was requested from the city. This building had not been sprinklered when other warehouses were so protected because of its "temporary" nature. Lack of inside watchman service contributed to the delayed discovery. The high value of the contents accounted for 92 per cent of the total loss, the value of the structure being only $20,000, the contents, $230,000.

March 5, St. Helena, Baltimore, Md. Chemical Plant. $415,000.

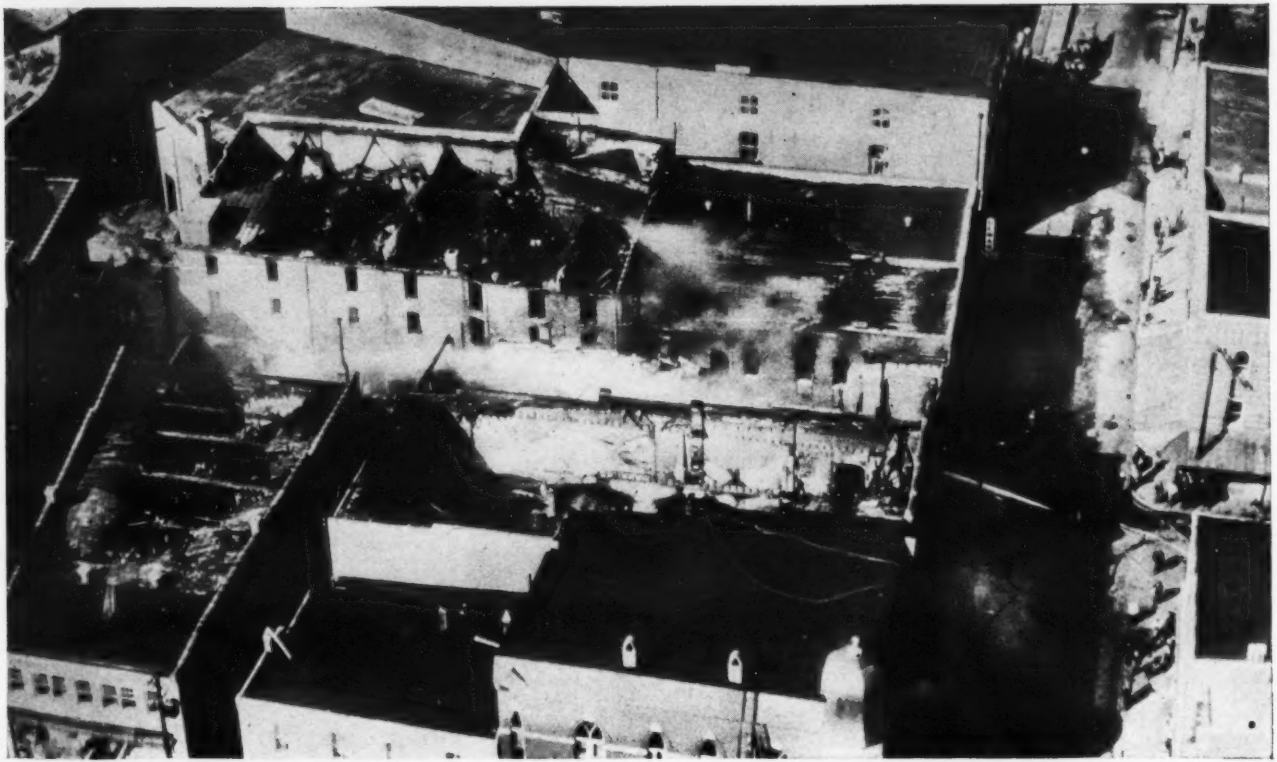
Flames spread quickly through the unsprinklered selenium processing building of the Glidden Paint Company (American Zirconium Division). The intense heat caused the walls and the roof of asphalt protected metal and unprotected steel-on-wood to collapse almost before fire fighters could place hose streams in action. The building was one of 35 on a 15-acre site occupied by the chemical and paint pigment plant. Long hose lines from distant public mains were required to bring water to the scene as there was no private fire protection system and mud flats along a nearby creek prevented taking suction from this source. The fire broke out at 5:15 P.M., soon after the 160-ft., one-story structure had been closed for the day. It was first reported by an employee in another building who used a manual fire box to give the alarm. Cause of fire was not positively determined, but it started at or near a gas-fired selenium reclaiming kettle, probably from ignition of nearby combustibles due to overheating. The chemicals used were not hazardous in nature. The fire rekindled at 5:39 A.M. the following day and a third fire struck the plant at 2:00 A.M., March 7th, destroying 2 other buildings of corrugated iron-on-wood frame construction. Loss, exclusive of use and occupancy, is estimated at $415,000. Normal production was estimated to be interrupted for at least 6 months.

March 10, New Castle Township, Pa. Coal Breaker. $500,000.

As if labor strife in the coal industry were not sufficient, 580 employees were made idle by a fire which destroyed the Repplier Coal Company's breaker which had an output of 2,000 tons per day. The fire, starting in the coal dump shed where workmen had repaired a conveyor with an acetylene torch several hours previous, was discovered by employees at 6:45 P.M. Four surrounding community departments responded to the alarm but could do little but stand by and watch the structure burn because of the swift spread of the fire and falling pieces of sheet iron, timbers, and machinery, which made approach hazardous. Wood floors, coal dust, grime and oil fed the flames and the unprotected girders buckled and swayed. (See photo page 205.)

March 14, Salisbury, Md. Group Fire—Mercantile. $250,000.

Four mercantile buildings housing Lupow's Style Center (ladies' wear), J. C. Penney Department Store, Davis Confectionery, Ulman Furniture Store and Warehouse, and Nathan's



Press Association.

Four mercantile buildings housing five stores (with 2 warehouses adjoining) were gutted in Salisbury, Md., on March 14, as lack of exposure protection featured in the spread of flames. In remodeling, wallboard had been used to close openings in a fire wall.

Four mercantile buildings housing five stores (with 2 warehouses adjoining) were gutted in Salisbury, Md., on March 14, as lack of exposure protection featured in the spread of flames. In remodeling, wallboard had been used to close openings in a fire wall.

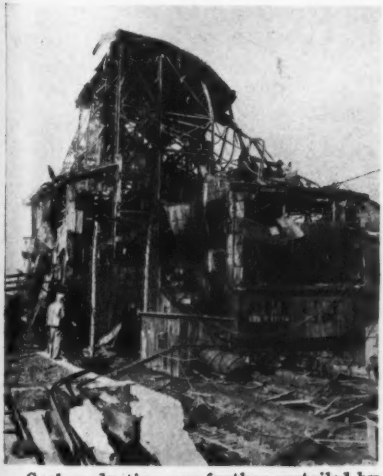
Furniture Store and Warehouse were destroyed by a fire discovered by a taxicab operator at 3:40 A.M. (See July, 1946, QUARTERLY, page 55.)

March 15, Emeryville, Calif. Electrical Equipment Mfg. $369,000.

Fire swept the Gardner Electric Manufacturing Company's plant as lack of any interior fire protection equipment and delayed discovery permitted the flames to travel unchecked throughout the building. (See July, 1946, QUARTERLY, page 56.)

March 16, Torbay, Nfld. Hangar. $600,000.

Fire of undetermined origin totally destroyed the large Royal Canadian Air Force hangar of steel-frame and wood construction at the Torbay Airport. The flames were discovered by a man on watch in the control tower at 1:05 A.M. One transport plane, one bomber, and one airship parked in the hangar were also destroyed, contributing to the extent of the fire because they contained an aggregate of 4,000 gallons of gasoline. In addition to these aircraft, 4 tractors, a snow plow, 1 crash tender, and a control truck, stored in the building, were consumed by the flames. The tower first notified Canadian and U. S. airport fire-fighting services and then called for help from the St. John's city fire department (1:28 A.M.). It was necessary for firemen to concentrate on protecting nearby buildings because of the intensity and extent of the fire and the proximity of other structures.



Coal production was further curtailed by the fire which destroyed this breaker of the Repplier Coal Company in New Castle Township, Pa., on March 10. **(See page 203.)**

Oakland Tribune.

No sprinklers, no automatic alarms, no fire division walls, no protection for special hazards, plus carelessness of employees, resulted in a total loss to the Gardner Electric Manufacturing Company in Oakland, Calif., on March 15.

March 16, Alton, Ill. Grain Mill. $1,485,000.

A full report on this fire in the Russell Miller Milling Company property was published in the July, 1946, QUARTERLY, page 57.

March 18, Suffolk, Va. Peanut Plant. $261,000.

The Parker Peanut Company lost their shelling plant by a fire which originated on the top (fifth) floor soon after employees quit for the day and before watchman service was scheduled. (See July, 1946, QUARTERLY, page 57.)

March 19, Near Grayling, Mich. Warehouse—Military. $275,000.

A one-story, brick, wood-joisted warehouse at the Michigan National Guard Military Reservation was totally destroyed by a 7:55 P.M. fire believed caused by faulty electric wiring. The unsprinklered building was located at a National Guard camp 5 miles outside city limits. Because the underground mains and hydrants had been drained for the winter, it was necessary for the city fire fighters to run a line to a lake 2,000 feet away to secure water. This naturally delayed getting effective hose streams on the blaze, but firemen were able to save a second warehouse of the same size (80 ft. by 250 ft.) located less than 40 feet from the burning building. Exploding ammunition and

Employees turned off the automatic sprinkler system in this grain mill in Alton, Ill., after fire resulted from an explosion in the dust-collecting room March 16. The loss was heavy as delay in alarm, inadequate public protection, and open vertical stairwells permitted the flames to travel unchecked.

ignition of 100 tons of coal in the basement complicated fire suppression efforts. The alarm was sent in by a passer-by and no official request for assistance was received from the watchman at the camp.

March 19, near Truckee, Calif. Aircraft. Over $250,000.

An Army C-47 transport plane exploded in flight and crashed on a snow-covered mountain 11 miles from Truckee. Twenty-three Army passengers and 3 crew members were killed instantly. Rescue parties on skis and snowshoes reached the scene only to discover the wreckage and dead scattered over a half-mile area. No reason for the explosion has been released by Army authorities.

March 21, Pittsburgh, Pa. Warehouse—Terminal. $2,000,000.

See the July, 1946, QUARTERLY, page 58, for details on this fire which heavily damaged the 5-block long terminal warehouse and train sheds of the Pittsburgh and West Virginia Railway Company.

March 22, Gadsden, Ala. Group Fire—Industrial. $276,000.

A gasoline spill of considerable quantity was occasioned when a 4-in. cap at the bottom of a 30,000-gal. railroad tank car was unscrewed (through negligence or ignorance) during unloading operations at a Shell Oil Company bulk station. The gasoline flowed from the railroad track embankment to the ground of a bulk plant, to the basement of an adjoining laundry, and was 4 inches deep in the gutter of the street. The fire department had 2 com-

Acme.

A $2,000,000 fire in Pittsburgh on March 21 caused heavy damage to the 5-block-long terminal warehouse and train sheds of the Pittsburgh and West Virginia Railroad. Tons of scarce food was destroyed in the fire, which is suspected to have been of incendiary origin.

panies at the scene before the fire started, following a police call at 1:00 A.M. When the vapors ignited (probably from a boiler in the basement of the laundry), an explosion resulted followed by a fire which totally involved and destroyed the laundry, a warehouse at the bulk station, and the tank car. Five gasoline and kerosene storage tanks were saved by fire fighters applying hose streams and loss of life was held to 2 by the timely evacuation of persons in the area a scant minute before the properties burst into flames. Those who did lose their lives were making desperate attempts to shut off the flow of oil at the tank car when the explosion occurred.

March 22, Chicago, Ill. Woodworker. $266,000.

The value of automatic sprinkler protection and of fire division walls with openings guarded by fire doors was vividly illustrated when flames swept the 2-story unsprinklered section of the Chicago Baby Carriage manufacturing plant. The fire was first observed by an employee at 6:05 P.M. and a telephone call was made to the fire department, coincident with attempts to fight the fire with first aid appliances. Because of the combustible nature of the contents, the flames in the unsprinklered portion were out of control when firemen reached the scene. Fortunately several automatic fire doors closed to prevent flames from entering an adjoining 6-story sprinklered building of brick, laminated-mill construction. One door was held ajar by a falling stock fixture and another was delayed by a defective link, but, in each case, operation of a few sprinkler heads held the fire from entering the 6-story section. The main fire was extinguished with 10 high-pressure streams and water towers, but not until heavy damages were sustained. The loss included a business interruption loss estimated at $125,000.

March 23, Emlenton, Pa. Group Fire—Mercantile. $350,000.

A 3-story, brick veneer, mercantile building (constructed in 1875), housing the Emil Long furniture and hardware store, a grocery store and offices, was totally destroyed by a fire which originated in the basement about 7:30 P.M. Fortunately, none of the patrons crowding the stores during Saturday evening sales was trapped by the fast spreading flames. The fire was well advanced when smoke was first

Starting at 7:30 p.m. in the basement of the Emil Long furniture store, this fire destroyed one 3-story building and gutted an adjacent bank building in Emlenton, Pa., on March 23. Saturday night customers escaped the building without injury despite a delayed alarm.

noticed issuing from the wall on the third floor. Paints, roofing supplies, rope and similar combustibles stored in the basement intensified the fire which traveled upward through the walls (lacking fire stops) and open stairwells. The adjoining First National Bank Building of brick construction and equal height was rapidly involved through unprotected windows and speedily gutted as fire fighters from 9 surrounding communities aided local volunteers in combating the flames. The bank vault withstood the heat and flames. Pumpers taking suction from a nearby river provided sufficient water supplies to prevent ignition of a seriously exposed railroad freight station and other mercantile stores across the street.

March 27, Lancaster, Pa. Warehouse—Tobacco. $900,000.

This fire was reported in detail in the July, 1946, QUARTERLY, page 59. It has since been reported that the arsonist (a medically discharged veteran) has received a sentence of from 5 to 10 years in the penitentiary for his crime.

March 28, Garwood, N. J. Metalworker. $500,000.

The large Thatcher Furnace Company plant was destroyed by a fire which started in the plate shop and spread unchecked through the 97,500-sq.-ft. single fire area. Weak water supplies, light construction and failure to cut off special hazards with fire-resistive walls combined to contribute to a total loss. (See July, 1946, QUARTERLY, page 59.)

March 28, So. San Francisco, Calif. Warehouse —Military. $770,000.

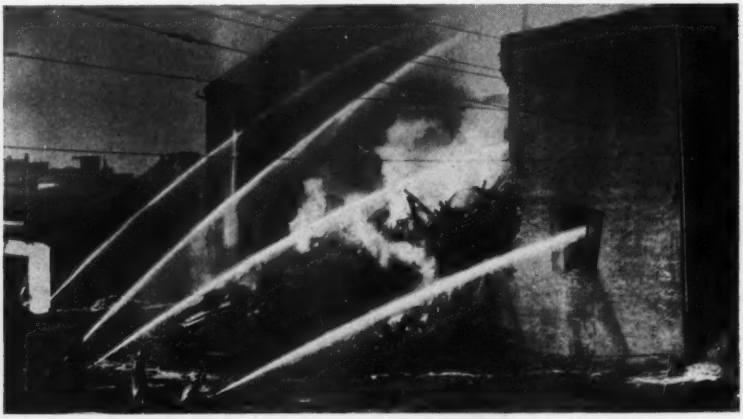
Two large area, unsprinklered, frame warehouses were destroyed and a third damaged at the Marine Corps Belair Sub-Depot when fire of undetermined cause went beyond the protection facilities available. Rubber tires, trucks and tractors were destroyed. (See July, 1946, QUARTERLY, page 60.)

March 29, Hull, Quebec. Group Fire. $925,000.

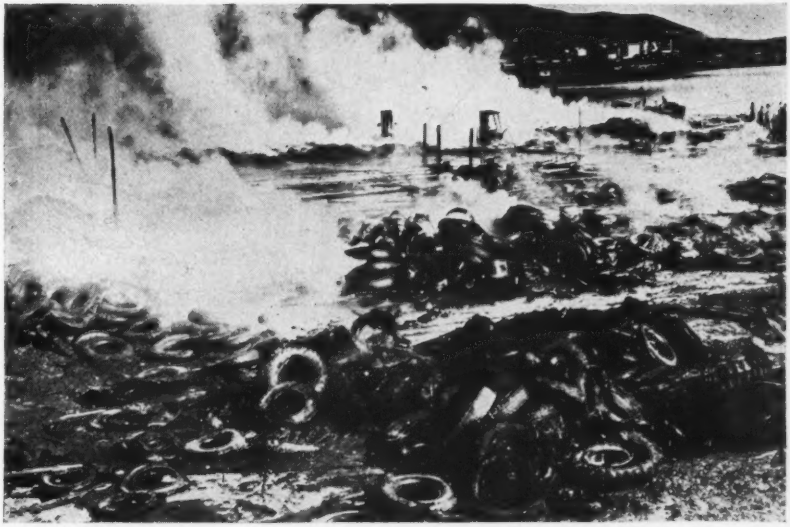
A sweeping fire which started on the Interprovincial railroad and vehicular bridge and involved an 18,000-cord stock pile of pulpwood and a conveyor of the E. B. Eddy Company required 49 hours of fire fighting before final extinguishment. (See July, 1946, QUARTERLY, page 60.)

March 30, New Orleans, La. Rice Mill. $390,000.

Fire occurred at 1:07 P.M. in a 2-story, wood frame, corrugated asbestos covered rice bin addition recently erected above a 2-story, brick-joisted, sprinklered warehouse of the Rickert Rice Mills, Inc. Adjoining and communicating via unprotected openings were the 4-story sprinklered mill section, a sprinklered warehouse and the boiler room. Sprinklers were to be installed in the addition, but were not as yet in operation. Fire was discovered simultaneously by employees on the outside and within the building and a private alarm box was pulled. Investigation indicated that the probable cause of fire was the transmission of heat through the corrugated asbestos siding from the boiler breeching. The New Orleans Fire



An incendiary fire destroyed 2,750,000 pounds of cigar filler and wrapper tobacco in the unsprinklered warehouse of the A. K. Mann Company in Lancaster, Pa., on March 27.

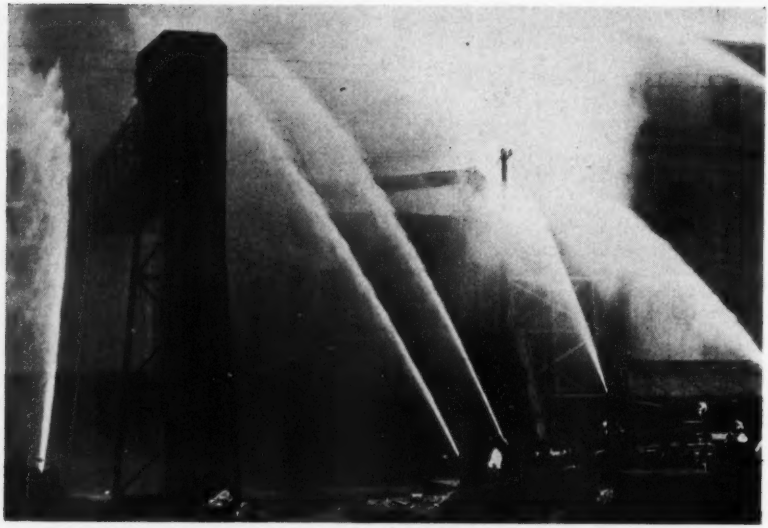


International News.

This view shows all that was left of two 9,000-sq. ft. frame and unsprinklered warehouses at the Marine Corps Depot in So. San Francisco after fire destroyed the structures on March 28.

Acme.

Eighteen thousand cords of pulpwood in a single pile were destroyed by a fire on March 29 which originated from a carelessly discarded cigarette on the Inter-provincial Bridge connecting Hull, Que., and Ottawa, Ont.



Scarce rice supplies and valuable protection time were lost as the result of a fire which destroyed a two-story addition to the Rickert Rice Mills in New Orleans on March 30. Automatic sprinklers were being installed at the time of the fire, but were not connected.

Dept. used 10 hose streams to extinguish the fire which was confined principally to the new addition. Fire extended to the mill building and warehouse through the unprotected openings, but these flames were controlled and extinguished by 68 and 2 sprinkler heads respectively. Only minor damages resulted in these two sections.

April 2, Laurel, Miss. Warehouse—Military. $538,000.

An explosion followed by fire destroyed the ordnance warehouse at the Laurel Army Air Base. No details are available except the explanation that the explosion was "probably caused by cosmoline used in processing machine guns."

April 4, Bass Lake, Ind. Group Fire. $500,000.

Flames in the vacant, old frame North Beach Hotel attracted the attention of a neighbor at 2:00 A.M. By the time the fire department arrived, the building was totally involved and flames, fanned by a stiff wind, were spreading to 4 frame business buildings and 3 dwellings located in a row along the lake. Two other nearby communities sent aid, but one pumper en route stopped to extinguish another fire. The business buildings destroyed housed a tavern, a restaurant, a barber shop and an abandoned fire station.

April 5, Winnipeg, Man. Grain Elevator. $400,000.

Tons of grain (designated for UNRRA shipment overseas) fed flames in the Federal Grain elevator in Winnipeg, as fire destroyed the new 3-story frame structure. (See July, 1946, QUARTERLY, page 61.)

April 7, McGraw, N. Y. Corset Factory. $266,000.

An early morning fire practically destroyed the 2-story frame building of the Vesta Corset Company. The structure was sprinklered by a dry pipe system supplied solely by a 6-in. village main by gravity from a reservoir and standpipe. The total water capacity available was 114,000 gallons and the static pressure was 87 lbs. at ground level. Only one hydrant off this main was located near the plant. No watchman service was provided, but a local alarm bell was connected to the sprinkler system.

A serious delay in discovery is indicated by the fact that a neighbor living 100 feet away smelled burning rubber at 11:00 P.M., but no alarm was sounded until 2:30 A.M., when flames were seen leaping 50 feet in the air. On arrival, the fire chief found the buildings a mass of flames from the ground to the eaves. The first pumper found insufficient water at the

hydrant and was forced to change position and take suction from a brook 200 feet away. Evidently sprinklers were operating at this time, although the local sprinkler alarm was not heard. The one engine available pumped into the sprinkler system for about 20 minutes, but changed to hose streams when it was decided fire had progressed beyond sprinkler control.

With the help of fire equipment from surrounding towns, parts of the boiler room and office were saved. Fourteen hose streams were used, all taking water from the brook.

There was much conjecture as to the reason for failure of the sprinklers to extinguish this fire in its incipiency. Evidence points to the fact that the fire originated near an electric fuse panel board against the wall. This area is sprinklered, but it is thought that the fire penetrated into the hollow wooden walls out of reach of sprinkler protection. As the fire traveled through the unstopped concealed area, sprinklers undoubtedly operated and held the interior fire in check until so many heads were opened that the weak water supply rendered them ineffective. The progress of the fire on exterior walls was unchecked and had passed the critical mark before discovery.

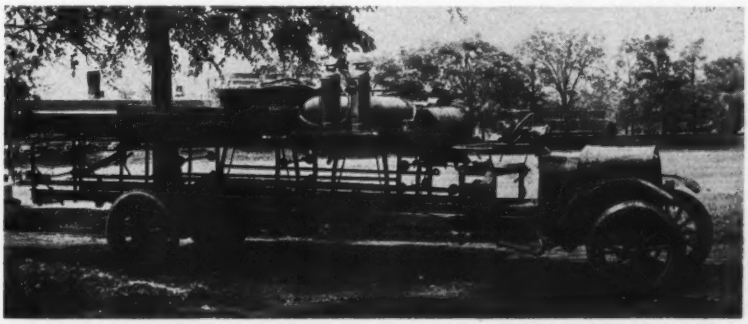
April 9, near Bolivar, Tenn. Insane Asylum. $350,000.

Thanks to daylight, 400 inmates were led to safety when a fire destroyed a 2-story brick-walled, unsprinklered wing of one of the main buildings at the Western State Insane Asylum. The blaze originated in a food elevator in the central part of the structure and quickly engulfed the old building (built in 1889). Fire-fighting equipment at the asylum was limited to a 1918 Model T Ford, with 2 chemical tanks, hose, and ladders. The private water system consisted of a 4-in. grid system with non-standard hydrants. Old and mildewed hose burst when attempts were made to fight the fire and assistance was requested from neighboring towns. Bolivar (2 miles distant), sent assistance but, by the time it arrived, the fire had progressed to such an extent that efforts were successfully concentrated on saving the other exposed portions of the building. Jackson (28 miles away) did not respond because their equipment could not use the non-standard hydrants.

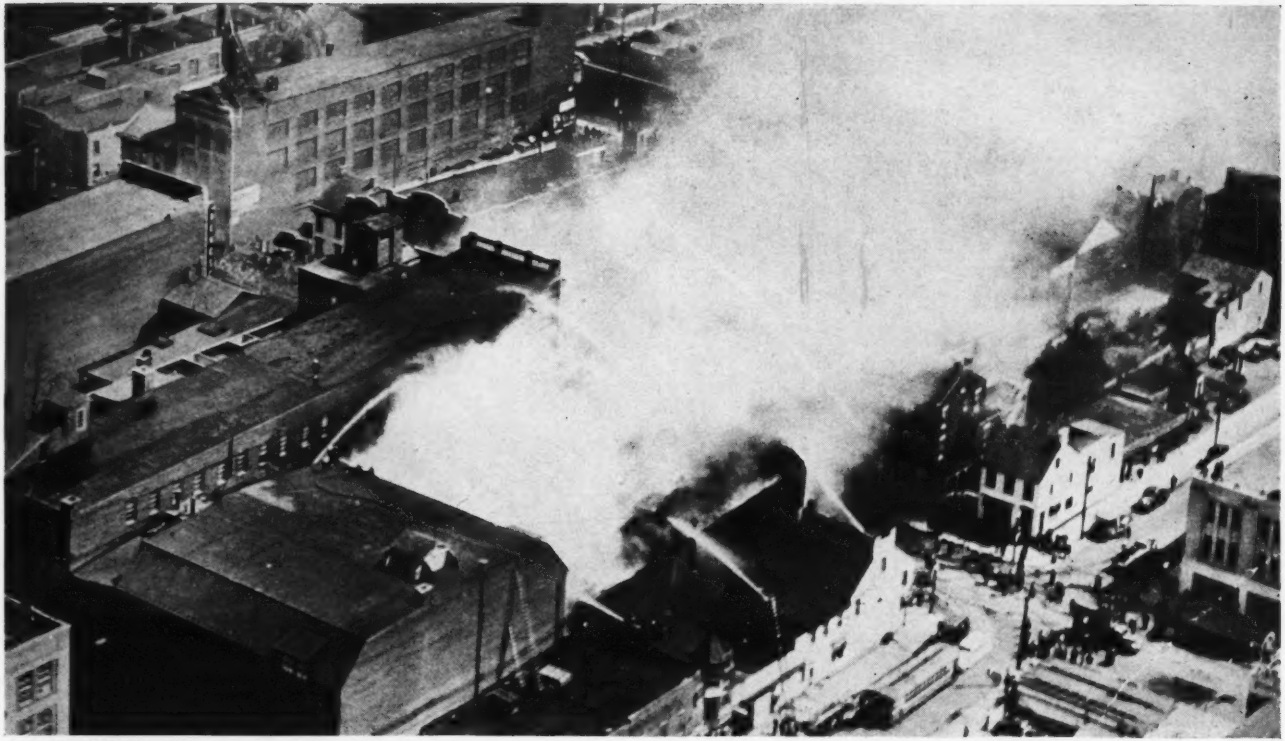
The sprinklered Vesta Corset Company factory at McGraw, N. Y., was destroyed by fire on April 7. The fire traveled up hollow wood walls out of reach of the sprinkler discharge until the flames were beyond the control of the single source public water supply available.

April 10, Allentown, Pa. Mercantile—Multiple Occupancy. $500,000.

Occupants smelled smoke hours before the alarm of fire was given by a passer-by. As a result, fire destroyed the Rialto building, housing a bowling alley, fur store, lunchroom, toy



A Model "T" Ford (1918) was the sole piece of apparatus available to fight the fire which destroyed one wing of the Western State Insane Asylum near Bolivar, Tenn., on April 9. Four hundred inmates escaped without loss of life, but the building was destroyed.



Press Association.

One fireman lost his life fighting this fire in the Rialto building in Allentown, Pa., on April 10. Origin of the fire was traced to the bowling alley in the basement, with flames spreading throughout the 3-story multiple-occupancy mercantile building through ventilation ducts and open stairwells.

The ventilating system, open stairwells, and unprotected horizontal openings permitted fire, originating in the basement, to gut this old high school in Butte, Mont., on April 10.

store, electrical appliance store, a theatre lobby, and upstairs office and apartments. (See July, 1946, QUARTERLY, page 61.)

April 10, Monessen, Pa. School. $300,000.

The Monessen Senior High School building was virtually destroyed by a fire which was discovered at 4:20 P.M., 30 minutes after the students had been dismissed. When the fire had been subdued, the body of the 64-year-old janitor was found under the debris.

International News.

The Fort Pitt Brewing Company bottling plant in Sharpsburg, Pa., heavily damaged by a fire which swept the 10,000-sq.-ft. second floor on April 12. Fire-resistive type flooring was valueless with open stairwells and elevator shafts.

Smoke was noticed coming out of the second floor windows of the 2-story brick structure by a teacher and pupil who were outside taking pictures of the building. Although the cause and point of origin remain uncertain, it is claimed that the fire originated at the top of the stage, worked its way down to the floor, and then spread to the auditorium. Flames had advanced through unprotected doorways, along corridors and up open stairways before they were discovered. When the blaze was finally extinguished at 12:30 A.M., unprotected steel wall and roof girders were a mass of twisted metal and the rest of the building was reduced to a pile of debris. The value of fire doors was clearly illustrated in this fire, as their presence prevented flames from extending to the adjoining junior high school building.

April 10, Butte, Mont. School. $425,000.

The old Butte High School was gutted by a fire which advanced beyond control before detection by an outsider at 9:35 P.M. The need for automatic protection and standard watchman service was an obvious lesson. (See July, 1946, QUARTERLY, page 63.)

April 12, Sharpsburg, Pa. Brewery Bottling Plant. $260,000.

The wood-joisted roof collapsed when fire burned out the second floor of the 2-story brick bottling plant of the Fort Pitt Brewing Company. Floors of this structure were of reinforced concrete supported on exposed steel columns

and girders. Elevator shafts and stairways were open. No sprinkler or automatic detection systems were installed.

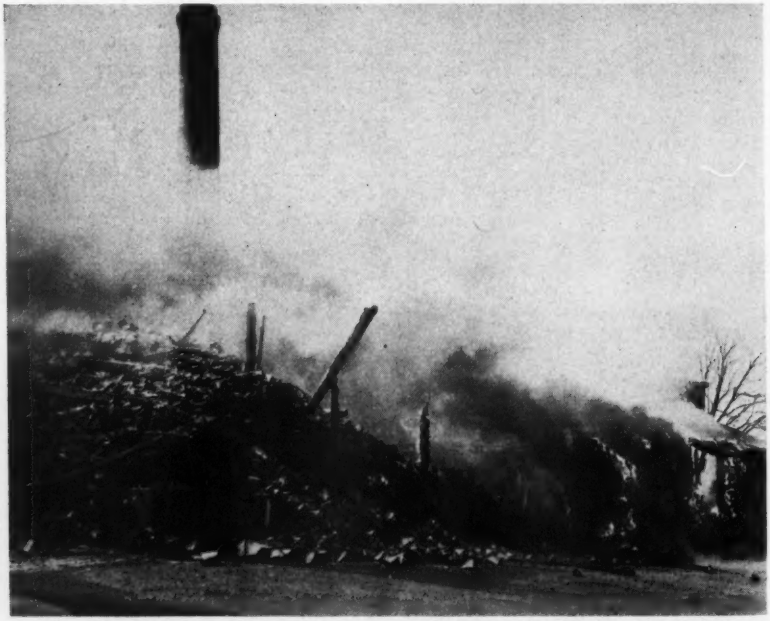
A delay on the part of employees in giving the alarm by telephone was one of the principal reasons for the extensive damage. Although the cause of the fire is uncertain, it is known that it started in a small repair room on the second floor where acetylene torch operations were in progress. From there it spread to an adjacent storage room packed with combustible advertising material and quickly involved the entire second floor, an area of 10,000 sq. ft. Flames penetrated to the first floor through the unprotected openings. Heavy smoke prevented immediate entry to the fire area, but firemen were credited with limiting damage to bottling machinery on the first floor.

April 13, Barre Center, N. Y. Cannery. $350,000.

Fire, which apparently had been smoldering for some time on the second floor of the Orleans County Canning Company plant, was noticed by a truck driver who was fueling his vehicle in the vicinity at 10:15 A.M. The unsprinklered building was half frame and half masonry, one and two stories high. The interior and roof, of light frame joisted construction, included a wood wall between the cannery proper and an abutting warehouse. The village of Barre Center has no public fire department and help was summoned by telephone from Albion, 4 miles away. A 400-gal. pumper was first dispatched and a second alarm brought another unit, but upon arrival both the cannery and warehouse were fully involved. Other neighboring towns also sent help, but as there was no public water supply in Barre Center and no provision made by the cannery for a water supply for fire-fighting purposes, it was necessary to draft from a well 800 ft. away and from a quarry hole 1,100 ft. away. The well water soon dropped below pumping level. A stiff wind carried sparks to the office and a nearby dwelling which also were destroyed. In the main plant, over 10,000 cans of tomato puree were destroyed by the fire.

April 14, Toronto, Ont. Grandstand. $250,000.

Two-thirds of the 726-foot grandstand at the Canadian National Exhibition grounds was destroyed by fire while under lease to the Army. (See July, 1946, QUARTERLY, page 65.)



Ten thousand cans of tomato puree were destroyed in this fire at the Orleans County Canning Company plant in Barre Center, N. Y., on April 13. Lack of public and private fire protection doomed the plant even at time of first detection.

Press Association.

This aerial view of the fire at the Allied Chemical and Dye Corp. plant in Philadelphia on April 20 shows fire fighters surrounding the inferno in an effort to protect exposed properties.

April 15, Roslyn, N. Y. Mansion. $450,000.

When firemen arrived at the gates of the Samuel Rubel estate with half the usual number of companies to extinguish what they assumed from a telephone call to be a brush fire, the 40-room, 3-story frame mansion was in flames. They were delayed in actually reaching the building as the gate was locked and the gate keeper denied admittance for a period while he verified the existence of a fire.

Additional help was summoned by radio, and lines were taken from pumpers hooked up to two private hydrants on the estate. Two lines were later run 1,400 ft. to public hydrants outside the main gate. In all, 5 engines from 4 nearby communities supplied 6 hose streams. In spite of the efforts of the firemen to save the fabulous dwelling, two wings were desroyed. Valuable contents destroyed included an organ, valuable paintings, and many pieces of antique furniture and jewelry.

Investigation has disclosed that the fire originated in the dining room, the walnut paneled walls of which were being refinished. Men were at work with benzine, turpentine and hand scrapers removing paint when one of them threw the light switch or struck the switch plate with his scraper, igniting the flammable vapors. The flames spread quickly over the room, into the main hall, and up the open stairwell. Lack of fire stops in the frame walls permitted the fire to extend through all partitions and walls. Some reports place the actual loss as high as $1,750,000, but this has not been confirmed since insurance coverage was limited to $450,000.

April 17, near Ritchie, Md. Aircraft. Over $250,000.

Four airmen lost their lives when an Army bomber exploded in the air and crashed on a wheat field near Andrews Field. The wreckage was strewn over a half-mile area and the fire was so intense that field and local volunteer fire fighters could not accomplish rescue operations. Foam was used in efforts to blanket the flames, utilizing the booster tank water supplies available on the responding fire equipment, but such limited quantities were ineffectual. The cause of the mid-air explosion has not been released by Army authorities.

April 20, Philadelphia (Frankford), Pa. Chemical Plant. $1,725,000.

A report of this fire at the Allied Chemical and Dye Corporation plant was published in the July, 1946, QUARTERLY, page 65. Additional information which has since become available indicates the cause to have been a static electrical spark at a benzol mixing tank. Foam was used extensively by fire fighters, not only to extinguish blazing tanks of benzol and solvents, but also to insulate exposed buildings against radiated heat.

International News.

Painters were responsible for a fire which gutted the forty-room dwelling of Samuel Rubel at Roslyn, Long Island, N. Y., on April 15.

April 28, St. Louis, Mo. Warehouse—Paint. $277,000.

At 12:30 A.M., a street car passenger discovered a fire in the one- and two-story brick, paint, and wallpaper warehouse of the Cook Paint and Varnish Company. A street box was immediately pulled, but by the time fire equipment reached the scene, the flames had gained such headway that three other alarms had to be sounded. The floors and roof of the warehouse were of wood-joisted construction, supported by unprotected steel columns and girders. A parapeted fire wall divided the building into 2 fire areas with automatic fire doors at all except one opening on the second floor. This single break in the division turned out to be of little value, since almost simultaneous with the passage of flame through this unprotected opening, fire also lapped over the parapeted wall into the adjoining section. The vertical spread of fire was aided by the open stairwells, and the light, wood-joisted roof construction caused a general collapse before effective control could be established. The paint contributed to the intensity of the blaze and flaming 5-gal. cans were hurled 50 ft. in the air. While the cause of the fire could not be determined, evidence indicates that it originated in an alcove immediately adjacent to one of the open stairways. Fifteen hose streams were used by fire fighters, with the streams directed through window openings. The owners had received estimates for the installation

Press Association.

A fireboat pours water on the "USS Solar" following a munitions explosion and fire at the Naval Ammunition Depot, Earle, N. J., on April 30, which wrecked the ship, killed seven, and injured more than 100.

of automatic sprinklers, but the system had not been installed at the time of the fire nor was any watchman service provided.

April 30, Earle, N. J. "U.S.S. Solar." Over $250,000.

Details of the munitions explosion and fire on this naval destroyer escort were published in the July, 1946, QUARTERLY, page 65.

May 1, Minneapolis, Minn. Excelsior Manufacturing. $574,000.

The 11-acre American Excelsior Corp. plant was swept by a fire which originated in grass

Minneapolis Star-Journal.

Insufficient water supplies for sprinklers and hose lines prevented controlling this fire which almost totally wrecked the American Excelsior Manufacturing plant in Minneapolis on May 1.

The 100,000 sq. ft. plant of the Technical Porcelain and Chinaware in El Cerrito, Calif., was destroyed by fire on May 22. Lack of fire division walls and automatic protection plus delay in transmitting the alarm were the outstanding factors contributing to the large loss.

and straw refuse and eventually destroyed 18 large area buildings, 4 of which were provided with automatic sprinklers. (See July, 1946, QUARTERLY, page 66.)

May 2, Arlington Heights, Ill. Racetrack Stable. $505,000.

Twenty-two valuable thoroughbred horses from the Maine Chance Farm died in a fire which an intoxicated watchman did not detect in time. (See July, 1946, QUARTERLY, page 67.)

May 5, near Lake George, N. Y. Road House. $250,000.

Two hundred patrons and 35 employees of the famous Halfway House escaped uninjured when fire broke out in the kitchen at 1:15 A.M. Believed caused by sparks igniting grease in the hood over the kitchen ranges, fire spread throughout the 3-story, recently renovated, century-old roadhouse located midway between Glens Falls and Lake George. The alarm was delayed while employees attempted to battle the flames with hand extinguishers and at the same time usher guests from the building. Lake George and Glens Falls Fire Departments answered the 2:00 A.M. call for assistance and drafted water from a pond 300 yards distant. The building was totally destroyed.

May 8, East St. Louis, Ill. Poultry Feed Warehouse. $725,000.

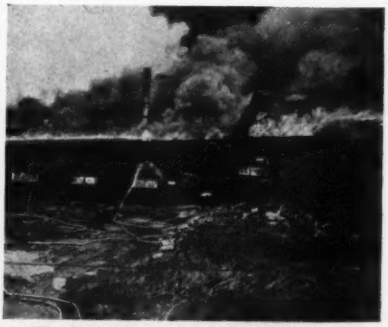
Details of this fire in the National Oats Company plant were given in the July, 1946, QUARTERLY, page 68.

May 22, El Cerrito, Calif. Porcelain Products Mfg. $464,000.

Fire originated in the second floor finishing room of his mostly one-story, frame, metal-clad unsprinklered building of the Technical Porcelain and Chinaware Co., Inc. At the time of the fire (9:09 P.M.) the plant was in operation, but employees were recessed for dinner. The fire chief is of the opinion that when the fire was discovered employees tried to extinguish the flames before summoning the fire department. Notification was eventually given by one employee, who then ran 1½ blocks to the fire station. Originally of small dimensions, the building had grown with the business until it covered an area of 100,000 sq. ft. with only a single fire division wall (without a parapet) segregating a third of the structure from the balance. The fire was stopped at this wall with the assistance of hose streams, the balance of the plant was destroyed. The cause of the fire was attributed to a faulty gas heater in the finishing room which ignited paints and combustible packing materials.

May 22, Rockland, Maine. Kelp Processing. $510,000.

Several thousand gallons of isopropyl alcohol in processing tanks and pipe lines fed the flames that destroyed the large one-story frame unsprinklered building of Algin Corporation of America within 30 minutes. The fire was first noticed at 1:30 P.M. at the base of a 10,000-gal. wooden alcohol tank. Workmen used extinguishers to fight the flames, but were soon forced to retreat when fire spread rapidly through the structure saturated with alcohol fumes. On arrival, firemen found the entire plant hopelessly involved and immediately



The large frame and unsprinklered kelp processing plant of the Algin Corporation in Rockland, Maine, was quickly consumed by a fire on May 22, which started near a processing tank of isopropyl alcohol and spread beyond control before fire fighters could reach the scene.

All that remained of the Silver Cocktail Lounge where the fire at the LaSalle Hotel in Chicago originated on June 5. Fire swept into the Coffee Shop through the unprotected door opening to the lobby, up open stairways and the elevator shaft, and through corridors and open transoms to trap 61 persons.

called for all available help to protect several exposures. When the first pumper connected to the city main, no water was available, as the full capacity was being used in the kelp processing and the shut-off could not be reached for about 15 minutes. The other 6 engines drafted salt water and did excellent work in extinguishing some 25 incipient fires in exposed buildings.

May 29, Los Angeles, Calif. Clothing Mfg. $500,000.

Falling glass attracted the attention of a passer-by to fire on the third floor of a 4-story textile manufacturing plant at 3:30 A.M. Firemen arrived without delay, following a telephone notification and found the premises of the Capital Manufacturing Co. wholly involved by fire. Flames had traveled to the second through fourth stories by unprotected vertical openings and resulted in total loss to the 3 upper floors. Fire had several hours in which to spread in a building lacking watchman service or automatic fire protection. Work had just been started (at the insistence of the Los Angeles Fire Prevention Bureau) to enclose the vertical openings which were a major factor in the spread of this fire.

June 5, Chicago, Ill. Hotel. $2,260,000.

The tragic LaSalle Hotel fire, which resulted in the death of 61 persons, was reported in detail in the July, 1946, QUARTERLY, page 4. The loss figure given above includes: $600,000 for fire damage; $1,000,000 business interruption insurance loss; $610,000 liability insurance for deaths, at $10,000 per person allowable by law.

June 6, Edmonton, Alta. General Storage Warehouse. $475,000.

Smoke pouring from top floor windows of the 4-story brick warehouse building of the MacCosham Storage and Distributing Company, Ltd., attracted the attention of an outsider at 7:07 P.M. The fire department was summoned by a box alarm, but flames had made such headway through the stored combustible contents (furniture wrapped in paper) that firemen were forced to direct their streams from outside the building. Although fire-resistive floors and enclosed stairways prevented the top floor fire from reaching lower levels, the combustible roof collapsed. General storage on lower floors was heavily damaged by smoke and water, except where protected by salvage covers. Cause of the blaze is unknown; it is

believed to have started in the excelsior-laden crating room. A combination janitor-watchman was on duty but, at the time of the alarm, was resting in his room on the third floor, unaware of the fire overhead. The loss was 85 per cent on contents.

June 7, Milwaukee, Wis. Lumber Company. $500,000.

Forty minutes after the watchman at the Hilty-Forster Lumber Co. had completed his 11:20 P.M. round, flames were discovered coming from one of 4 adjacent frame lumber sheds by passengers on a street car. The arrival of fire apparatus gave the watchman his first inkling that anything was wrong. The fire spread rapidly and before it could be stopped a one-story frame box factory and planing mill, a 2- and 3-story, partly fire-resistive, combination boiler house and shavings vault, a one-story, hollow concrete block garage, as well as the four 1- and 2-story sheds and outside stock piles of lumber were nearly a total loss. The yard was one fire area covering 4½ acres. Access among the buildings for fire fighting was impossible and hose lines, originally connected to yard hydrants, had to be withdrawn and connections made to distant hydrants. Only 2 approaches were possible because a river (very low at the time) and a high hill partially surrounded the plant. Lack of developed roadways in the area also slowed approach. A street car trestle which passed over the yard was damaged by the heat and flames.

Enclosed stairwells and fire-resistive interior construction held this fire in the MacCosham Storage and Distributing Co., Ltd., warehouse to the top floor on June 6.

June 7, Hamilton, Ont. School. $950,000.

The large Hamilton Central Collegiate secondary school was totally destroyed by a fire which swept the structure after delayed discovery of the blaze which started in the attic. (See July, 1946, QUARTERLY, page 68.)

The Hilty-Forster Lumber yard in Milwaukee was almost totally destroyed, as the 4½-acre plant was swept by a fire on June 7, which originated in one of four large frame sheds. Delayed discovery, inadequate water supplies and a stiff breeze handicapped extinguishment.

Press Association.

The Bath Box Company suffered a total loss on June 10 when wind-driven flames from a fire in a small shaving baler house ignited the exposed side walls and the roof of their large sprinklered factory. Hundreds of sprinklers opened and completely overtaxed the limited water supply available.

June 9, Dubuque, Iowa. Hotel. $407,000.

The second serious hotel fire in less than a week (see June 5, Chicago, Ill., LaSalle Hotel) caused the death of 19 persons in the Hotel Canfield. (Details in the July, 1946, QUARTERLY, page 19.) The loss indicated above is divided: $135,000 to building; $45,000 to contents; $37,000 use and occupancy, and $190,000 to cover liability for loss of life ($10,000 per person).

June 10, Bath, Maine. Box Factory. $350,000.

Fifty-mile-per-hour winds carried flames originating in a small, unsprinklered shaving baler house to the large, frame, sprinklered factory of the Bath Box Company. The heat of the wind-driven flames ignited the entire exposed side walls and roof and quickly penetrated unprotected window openings, igniting the highly combustible contents. Hundreds of sprinkler heads opened almost simultaneously and the tax on the single source public water supply was so heavy that the discharge from each head was insufficient to cope with the flames. Fire fighters could not approach the fire from the lee side, as the plant was located on a wharf on the Kennebec River. Approach from the windward side not only complicated fire fighting but also was disadvantageous because of stacked lumber piles which were ignited by direct exposure. Burning embers were carried over a mile by the gale winds and caused 2 fires in dwellings. Eighty-five employees of the plant escaped, some reaching safety by taking boats from the wharf.

June 12, Whiting, Ind. Refinery. $250,000.

The Standard Oil Company (Indiana) Refinery in this city was the scene of a fire which threatened to extend from the barrel filling room and storage building to the compounding plants and high octane gasoline storage tanks. Despite explosions of oil drums, the fire was successfully confined to the two buildings immediately involved. (See October, 1946, QUARTERLY, page 115.) (Photo page 222.)

June 12, near Gatlinburg, Tenn. Aircraft. Over $250,000.

An Army B-29 bomber crashed into the wooded slopes of Clingman's Dome, killing all 12 members of the crew. Fire broke out instantly from the impact and when rescue parties reached the scene, several hours later, all the bodies were burned and parts of the wreckage were still smoking. Forest rangers gave the first alarm and worked with Army crash convoy crews removing the bodies.

June 15, Bible Hill, Nova Scotia. College. $250,000.

Details of the destruction of the Science Building of the Agricultural College were published in the July, 1946, QUARTERLY, page 71.

Acme.

The Whiting (Ind.) Refinery of Standard Oil was the scene of this fire on June 12, which started in the barrel filling house and spread to the storage section through barrel passageways. (See page 221.)

Acme.

This aerial view shows the extent of the Medford, Ore., group fire on June 25.

June 21, Dallas, Texas. Hotel. $535,000.

An explosion in the basement of the 18-story Baker Hotel resulted in death to 10 persons and injury to more than 30 others, the majority being hotel employees. Work was being completed on the relocation of the commissary department in one corner of the basement, and, at the time of the blast (11:13 A.M.), 2 men were at work in a concealed, shallow space located above this area and having a volume of approximately 4,000 cubic feet. Many pipes ran through this space, including water, soil, ammonia, and natural gas. Testimony indicates that an undetermined type of gas, probably natural gas, accumulated in this confined space and was ignited by a spark from an unknown source. It is known that just prior to the explosion, one of the workmen was plugging in an electric fan to dissipate heat and gas that was hampering the work. Extensive explosion damage was suffered in the basement and the kitchen above. Good housekeeping by hotel employees was cited as the main reason no fire of any consequence followed the blast. The loss is divided: $400,000 property damage; $35,000 business interruption loss; $100,000 liability for deaths ($10,000 per person).

June 25, Medford, Ore. Group Fire—Industrial. $1,000,000.

A fire in the 38,000 sq. ft. frame American Fruit Growers packing plant spread beyond control and razed three city blocks in the heart of the industrial section. (See October, 1946, QUARTERLY, page 115.)

June 25, Staten Island, N. Y. Ferry Terminal. $2,000,000.

Three thousand firemen fought for 3 days before final extinguishment was secured in a fire which destroyed the Municipal Ferry Ter-

Flames swept over 5 acres of waste paper stacked in the yard of the Fiberboard Products Corp. plant in Antioch, Calif., on June 27. An exposed brick building without window openings was saved despite high winds. (See page 226.)

...ning (Tex.) Refinery of Standard Oil was the scene of this fire on June 12, which started in the barrel filling house and spread to the storage section through barrel passageways. (See page 221.)

Acme.

Four fireboats and 38 engine companies fought the largest fire in Staten Island's history on June 25 when the Municipal Ferry Terminal was totally destroyed.

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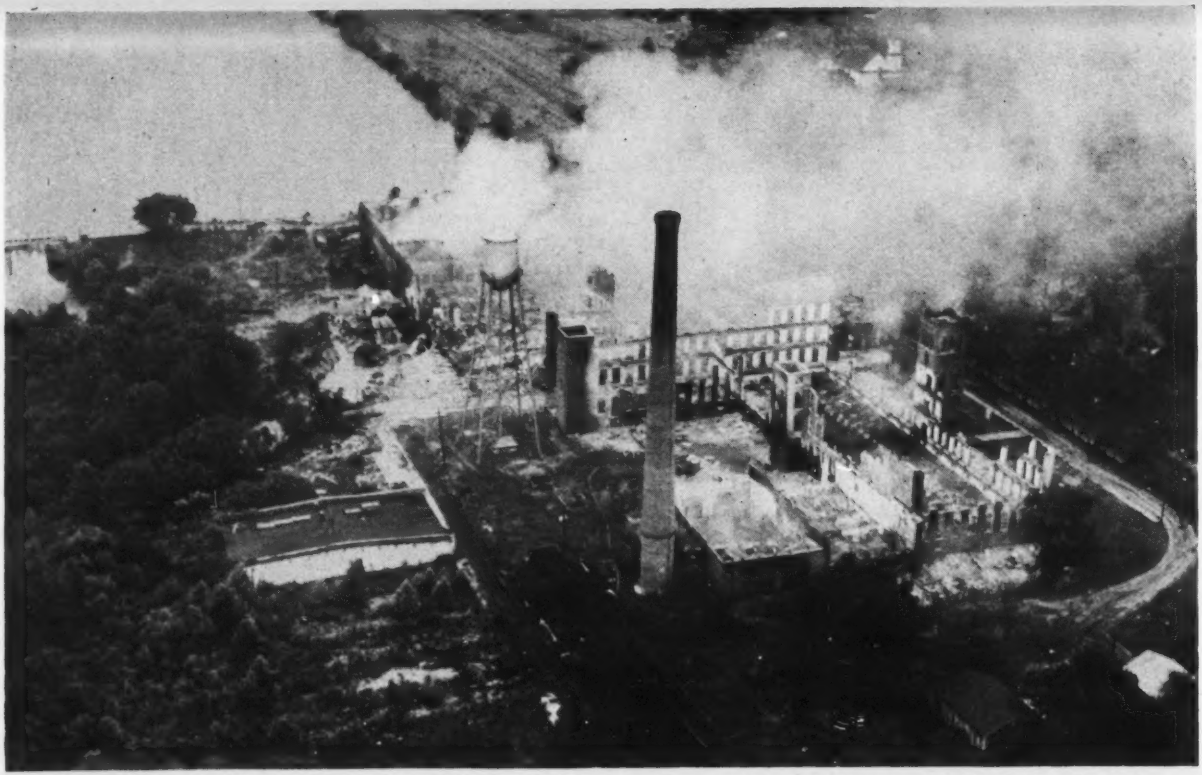


This aerial photograph shows the remains of the Langley, S. C., textile warehouse, which was completely destroyed by fire on July 3. Automatic sprinklers were improperly closed, an untrained watchman erred in judgment, and local fire departments were found wanting of advanced planning. **(See page 226.)**

minal and Rapid Transit Railway platforms and cars. Three persons lost their lives. (See October, 1946, QUARTERLY, page 117.)

June 27, Antioch, Calif. Paper Product Mfg. $250, 000.

A yard fire which swept an area of 5 acres destroyed large quantities of paper and straw in 25 ft. high stacks at the Fiberboard Products Corporation plant. (See October, 1946, QUARTERLY, page 118.)

July 1, Franklin, Pa. Church. $250,000.

Neighbors were awakened at 1:30 A.M. by the crackling of flames and discovered an advanced fire in the 80-year-old brick First Presbyterian Church. A telephone alarm was given and the fire chief, on arrival, immediately realized the seriousness of the situation and summoned aid from 3 surrounding towns. A brick wall separated the Sunday School chapel, where fire originated, from the main church. However, a large round hole above the false ceiling in the chapel destroyed the value of this wall as a fire stop. A strong suspicion of arson was indicated in the local press.

July 2, Dinuba, Calif. Winery. $630,000.

Details of this fire in the Alta Vineyards Company winery were given in the October, 1946, QUARTERLY, page 118. The loss is divided $370,000 for property damage and $260,000 for business interruption.

July 3, Langley, S. C. Warehouse—Textile. $3,840,000.

Full details and a plan of the Langley Manufacturing Company mill fire were published in the October, 1946, QUARTERLY, page 119. The fire-fighting aspects were discussed in the October, 1946, *Firemen*. (Photo page 225.)

Associated Press.

The Airplane Repair Hangar at Wendover Field, Utah, was totally destroyed on July 6 by a fire which started in a battery charger.

July 6, Wendover Field, Utah. Hangar. $1,500,000.

Flames breaking through the roof of an unsprinklered frame airplane hangar at Wendover Field attracted the attention of Army-employed civilian fire fighters at the Air Field fire station at 8:00 P.M. The entire structure and 6 airplanes stored within were involved when these fire fighters reached the scene. Reductions in fire department strength following the war acted as a severe handicap, as only 3 engine companies were available and over a third of the force had been on duty only 3 days when the fire occurred. The chief was not on duty at the time and supervision was poor. The flames spread to 6 small structures in the area, all of frame construction, due to the radiated heat. The apparent cause of the fire was defective wiring in a multiple battery charger.

Press Association.

Howard Hughes miraculously survived this crash fire in Beverly Hills, Calif., on July 7.

July 7, Beverly Hills, Calif. Aircraft. $8,100,000.

One of the most miraculous escapes from death ever to occur in an aircraft accident was achieved when Howard Hughes climbed or was thrown clear of the wreckage of his experimental photographic plane amidst flames which totally destroyed the aircraft. The accident occurred on a test flight of the new reconnaissance plane the Hughes Aircraft Company had designed for the Army Air Forces. Engine or propeller failure in flight presumably caused the plane to crash in the residential area of Beverly Hills, striking a private home and a garage, damaging two other residences, and finally landing in a vacant field. Flaming gasoline ignited the dwelling and garage and the impact caused the gas main to the residence to be broken. Fire apparatus reached the scene promptly and used high pressure hose lines on the gasoline fire to successfully blanket the flames except for the domestic gas line, which

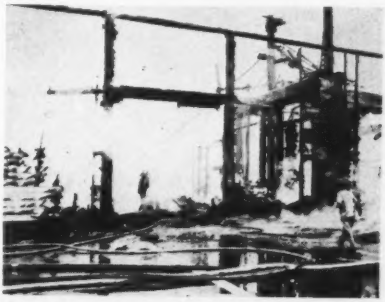
was allowed to burn for several hours until the utility company arrived to shut off the gas. The aircraft fuel tanks were fractured and the leaking gasoline formed a stream of liquid fire which also was allowed to burn itself out. Exposures (valued at $200,000) were protected by water curtains. The loss figure given includes the research and development costs (estimated at $8,000,000) on the prototype XF-11 aircraft and $100,000 for the loss of the residence and its contents.

July 9, near Holyoke, Mass. Aircraft. Over $250,000.

Twenty-five lives were lost in the flaming wreckage of an Army B-17 "Flying Fortress" on the wooded slopes of Mt. Tom, near Holyoke. The official investigation of the crash found that bad weather and the fact that the pilot lacked familiarity with radio procedure were to be blamed for the accident. This contradicts eye-witness stories that fire in one engine was observed prior to the ground collision, but, irrespective of the causal factors, fire played a major role in preventing effective rescue of the trapped victims by volunteers and fire fighters from Holyoke and Westover Field.

July 10, San Francisco, Calif. Navy Repair Base. $300,000.

Operations had ceased for the night, but the watchman had not as yet started his rounds at 5:47 P.M. when fire was discovered in the pipe shop at the Hunter's Point Naval Repair Base by a civilian employee. This fire originated in a locker room on the mezzanine floor (measuring 12 ft. by 120 ft.) of the unsprinklered, one-story frame structure, having a ground floor area of 10,000 sq. ft. Eight minutes after the yard alarm had been sounded, summoning the private brigade, public apparatus was called. On their arrival, city firemen found the building totally engulfed in flame and seriously threatening adjacent shop buildings. The pipe shop was a total loss.



Acme.

The Pipe Shop at the Hunter Point Naval Repair Base, San Francisco, destroyed by a fire on July 10.

Press Association.

The burned out fuselage of the TWA "Constellation" which crashed near Reading, Pa., on July 11 is grim testimony to the origin of the fire sustained in flight which cost the lives of 5 out of a crew of 6. **(See page 228.)**

Acme.

The Schenley Distillery fire in Ripon, Calif., on July 11 destroyed a large portion of the lightly constructed sprinklered plant after an explosion ruptured the piping and cut off power to the fire pump.

July 11, 1946, near Reading, Pa. Aircraft. $750,000.

Details of the fire in flight and at time of crash in the TWA "Constellation" was given in the October, 1946, QUARTERLY, page 121.

July 11, Ripon, Calif. Distillery. $700,000.

The sprinklered Schenley distillery and winery was destroyed by an explosion and fire causing losses estimated at $250,000 to building, machinery and equipment, and $450,000 to stock. (For details see October, 1946, QUARTERLY, page 123.)

July 11, Clinton, Mo. Group Fire—Mercantile. $300,000.

Fire broke out in the refrigerator room of the 2-story, brick Kimball Cold Storage building, and wind-driven flames leaped an alley to involve and ultimately destroy a theatre building, a grocery store, and a garage, and cause damage to 9 other buildings. The blaze started in insulation material being used during remodeling of cold storage lockers, apparently a rekindling from a fire 2 hours earlier which firemen believed had been extinguished. A neighbor discovering the new blaze at 7:15 P.M. ran to the fire station to give the alarm.

July 14, Pictou, Nova Scotia. Piers. $836,000.

Fire swept three 600-foot piers and damaged marine and railroad equipment as absence of automatic protection prevented timely discovery. (See October, 1946, QUARTERLY, page 123.)

July 18, near Goodland, Kans. Aircraft. Over $250,000.

An Army C-47 with 14 aboard crashed while attempting an emergency landing in a wheat stubble field 3 miles from the nearest airport during a severe lightning and high wind storm. It was apparent that impact injuries caused the deaths of the full complement, as medical examination disclosed that all skulls were broken and the bodies mutilated as well as burned. The crash caused the fuel tanks to be torn loose and it is assumed that fire was practically instantaneous.

July 21, Lincoln, Calif. Fruit Cannery. $1,000,000.

Fire was discovered in the warehouse of the Lincoln Packing Co. by a truck driver at 8:00 P.M. one-half hour after the night watchman had checked in at this building and found everything in order. An attempt to summon aid was delayed because of insufficient steam to blow the fire whistle. Eventually private and public firemen arrived and attempted to fight the fire, but their efforts were ineffectual because of lack of training in methods of handling a fire of this size, insufficient apparatus and hydrants, and lack of personnel (many of the fire-

Three piers, each 600 ft. long, were destroyed by a fire in Pictou, Nova Scotia, on July 14. The origin was in a concealed space under the wood decking.

men, including the chief and assistant chief, were out of town). Only 2 hydrants, both located on the lee side of the building, were available and firemen took 3 lines directly, running only one through a pumper to secure better pressures. Operations were twice discontinued because of the tremendous heat. Investigation disclosed that the fire started in a one-story, wood and corrugated iron warehouse. The flames were driven by a dry south wind under the wooden floor and through the large undivided and unsprinklered storage building. From the warehouse, fire spread through all units of the 5-acre fruit packing plant, sparing only the cold storage building still under construction.. Five hundred employees were thrown out of work.

Acme.

A basement fire in this multiple occupancy mercantile, Oakland, Calif., July 25, was only discovered by a passer-by as smoke was observed from the street.

July 25, Oakland, Calif. Multiple Occupancy—Mercantile. $321,000.

Smoke coming from the unsprinklered basement of the Simon Hardware Company attracted the attention of a passer-by, who pulled a street box at 8:12 P.M. The careless disposal of a cigarette in the basement receiving room, where considerable excelsior and paper was present, is given as a possible cause. By the time apparatus arrived the fire had gained considerable headway and was extending up the open stairway of the 4-story, brick-joisted building to the ground floor sales rooms and the Broadway Hotel on the second floor. Joists burned out, causing a small portion of the first floor to collapse, but the combined efforts of 14 engine companies, using 30 large hose streams, stopped the flames at the second floor. The 50 hotel guests on the 3 upper floors all escaped unharmed with the help of firemen who battled the dense smoke that rose through open stairways and choked upper floors. Fire walls in the basement restricted the lateral spread of fire to the hardware company premises.

July 29, Miami, Fla. Aircraft. $544,000.

A Navy Corsair went into an inverted spin during flight maneuvers at 15,000 ft. and the pilot bailed out. The pilotless plane eventually crashed on the Naval Air Station flight line, killing 2 (one from burns), injuring twenty, and damaging 21 parked planes. Numerous small fires were started which, had they not

been immediately controlled, would undoubtedly have caused even greater damage. The Naval Air Station Fire Department was promptly on the scene and using foam and carbon dioxide blanketed the incipient fires successfully through their knowledge and training of crash fire suppression techniques. The flash fires and explosions caused eleven of the casualties and flying debris ten. Damage to aircraft was estimated at $534,000, and to the hangar and concrete ramp at $10,000.

Aug. 1, near San Diego, Cal. Aircraft. Over $250,000.

A Navy consolidated patrol bomber (B-24) crashed 1¼ miles off the Marine Corps Air Station at Miramar, carrying its 12 occupants to death. The heavy 4-engine plane exploded at impact and an estimated 2,300 gallons of gasoline were ignited. Crash equipment responded after an alarm from the control tower and used high pressure fog on the flames in an effort to reach the victims. Limited water supply from booster tanks (total 900 gallons) was not sufficient, however, and the aircraft was completely destroyed by fire.

Aug. 1, Kingston, Ont. Mercantile—Multiple Occupancy. $520,000.

See the October, 1946, QUARTERLY, page 125, for details on this fire which totally destroyed the Chown, Ltd. multiple occupancy mercantile building.

Aug. 1, River Rouge, Mich. Lumber Mill and Yard. $1,500,000.

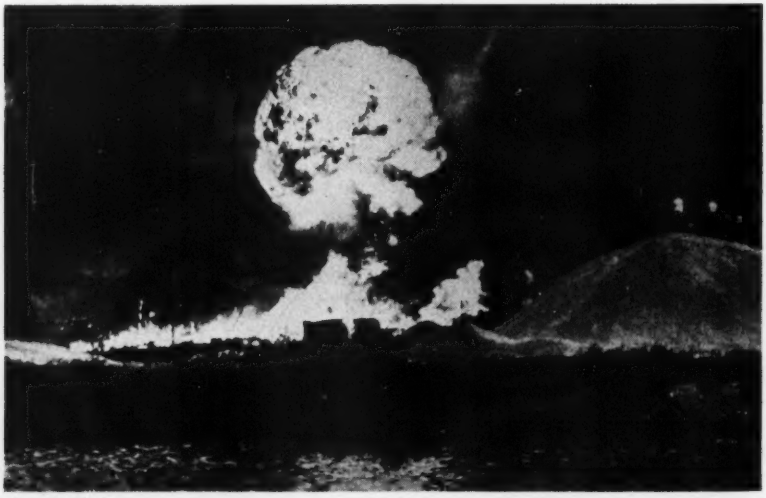
Original information on this loss was published in the October, 1946, QUARTERLY, page 127. Since that time, it has been ascertained that no creosote was in the yard of the Brownlee Company at the time of the fire.

Aug. 2, Endicott, Wash. Grain Elevator. $300,000.

A passer-by discovered fire at 2:00 A.M. in the frame metal-clad grain elevator of the Endicott Elevator Co. Volunteer firemen responding to the alarm not only found the elevator too far involved in flames to be saved, but also that the city fire station nearby was seriously endangered. Despite efforts of the firemen, aided by departments from 4 neighboring towns, the elevator was totally destroyed, the fire station badly burned, and 5 other buildings slightly damaged.

Aug. 5, near Torrance, Calif. Aircraft. Over $1,000,000.

During an experimental test flight of the C-74 Douglas "Globemaster," structural failure at the outer wing panels caused the plane to crash. The crew successfully bailed out and no injuries were sustained. The great plane, weighing approximately 85,000 lbs. and carrying 8,000 gallons of gasoline, exploded upon impact after striking high tension power lines in its pilotless plunge. Fire equipment from



Press Association.

The Brownlee Lumber Company in River Rouge, Michigan, suffered a disastrous fire August 1, which caused damage estimated at $1,500,000. The photograph shows an explosion of volatile liquids.

the Long Beach Army Air Field, Los Angeles County, Los Angeles City, and Douglas Aircraft responded to battle the fires which covered an area over ½ acre in size. Oil, hydraulic fluid and alcohol added more fuel to the gasoline-based fire and the high magnesium content of the aircraft structure complicated extinguishment operations. The loss figure given is a modest estimate, as the actual development costs of this aircraft, the pilot model, were undoubtedly higher.

Aug. 5, Jacksonville, Fla. Tanker. $1,250,000.

A 500-ft. oil tanker loaded with 38,000 barrels of oil was struck by lightning during unloading operations. (See October, 1946, QUARTERLY, page 129.)

Aug. 6, Clyde, Wash. Grain Elevator. $300,000.

Fire, believed to have originated in the engine room, destroyed the grain elevator owned by the Morrison Grain Co., filled to capacity with an estimated 200,000 bushels of wheat. The fire, discovered by the manager of the elevator at 7:30 P.M., had spread to the adjacent warehouse before arrival of district fire equipment. Efficient fire fighting saved most of the warehouse and prevented flames from reaching nearby buildings and bulk oil storage tanks. This was the worst of a series of fires which destroyed wheat storage facilities in Walla Walla County within a fortnight, the aggregate loss of which was a half million bushels.

Aug. 11, Staten Island, N. Y. Marine Repair Yard. $250,000.

The second large fire in Staten Island within 2 months destroyed two dry docks, a ferry boat and a barge at the Brighton Marine Repair Yards. (See October, 1946, QUARTERLY, page 131, for details. Photo page 232.)

Aug. 19, Omaha, Neb. Warehouse. $307,000.

Details of a fire which destroyed the Massey-Harris Farm Implement Company 5-story, block-long warehouse were given in the October, 1946, QUARTERLY, page 133.

Aug. 27, Oregon Township, Ohio. Alfalfa Warehouse. $320,000.

High piles of stock smoldered for more than 18 days after fire, starting in the one-story, skeleton ironclad warehouse of the Ralston Purina Co., totally destroyed 60,000 bags of meal. Car inspectors from a nearby railway yard noticed smoke coming from the building at 4:00 P.M. and telephoned the alarm. Flames spread rapidly through the undivided building,

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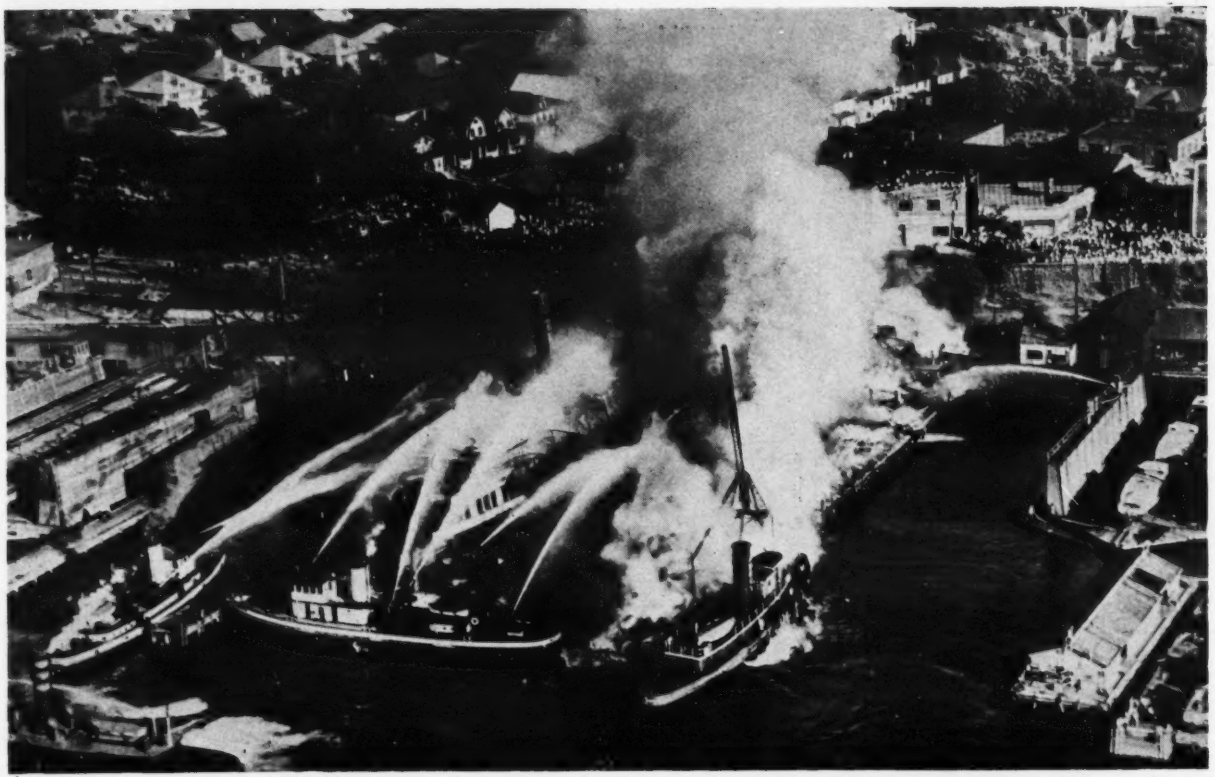
Lightning struck the 500-ft. oil tanker "S. S. Homestead" while unloading at the Standard Oil Company docks in Jacksonville, Fla., on August 5. Three men lost their lives.



Acme.

Fireboats poured tons of water on this fire of August 11, which caused heavy damage to the Brighton, Staten Island, New York, Marine Repair Yard. This was the second major waterfront fire in Staten Island in as many months. Again, fire under deck planking made fire suppression with manual lines and fireboats exceedingly difficult.

The Standard Milling Company's grinding mill and elevator at Lubbock, Texas, were totally destroyed by a fire on August 27, which employees discovered in the sack room and attempted unsuccessfully to extinguish themselves before calling the fire department.

Fireboats poured tons of water on this fire of August 11, which caused heavy damage to the Brighton, Staten Island, New York, Marine Repair Yard. This was the second major waterfront fire in Staten Island in as many months. Again, fire under deck planking made fire suppression with manual lines and fireboats exceedingly difficult.

and when the volunteer fire department arrived, the entire inside of the building was in flames. Four 2½-in. streams from two engines drafting from a creek (the sole supply) were put into action, but the close, high piling of bagged meal, the large building area (13,680 sq. ft.), the corrugated metal walls and roof, and the limited water supply available rendered fire-fighting operations practically useless.

Aug. 27, Lubbock, Texas. Grain Mill and Elevator. $302,500.

A delay of 20 minutes in calling the fire department was perhaps the chief reason for the heavy loss in this fire which completely gutted the grain mill and partially destroyed 2 elevators of the Standard Milling Company. Following a small fire in the grinding mill in the afternoon, which was apparently extinguished, employees again discovered flames at 7:00 P.M. in the sack room of the large, one-story, brick-joisted mill building. They attempted to extinguish the blaze with hand extinguishers before calling the fire department by telephone. When firemen arrived at 7:25 P.M. with three pumpers and a ladder, the unsprinklered mill building was completely involved, and the flames had spread to the smaller of 2 adjoining frame elevators, both filled with grain. The first elevator toppled at 8:00 A.M. A dust explosion in the larger elevator strewed sheets of metal roofing among firemen and spectators. Sparks ignited and burned off part of the roof of a one-story, brick-joisted warehouse, also well stocked with grain, but firemen were successful in saving the major portion of this structure.

August 28, Wenatchee, Wash. Group—Mercantile. $950,000.

Fire destroyed 3 adjoining 2- and 3-story brick-joisted buildings and, driven by a brisk wind, jumped a 30-ft. alley to destroy a fourth one-story brick-joisted structure. The cause of this fire was not determined. It is known to have started in the middle of the 3 structures, which was still in process of construction, but was occupied by the J. D. Hamilton Fruit Co. Flames, discovered coming through openings in the unfinished roof, were quickly carried across the alley to the rear of the Dallam Furniture Co. store. Plain glass windows in this building quickly succumbed to the heat and flames. Simultaneously, flames were spreading through unprotected wall and roof openings in the building of origin to the 2 adjoining structures, one occupied by a truck terminal and warehouse company and the other by a cold storage fruit plant. None of the 4 buildings had automatic sprinkler or alarm protection.

The delayed discovery, coupled with the fact that the gathering spectators neglected to sum-

mon the fire department at once, made the task of the small Wenatchee Fire Department practically hopeless. Seven 2½-in. lines took water directly from hydrants at 100 lbs. pressure and one turret nozzle was used. An adequate supply of water was available at all times, although electric power failure caused by the fire stopped the pumps that are used to keep the public water reservoir full.

An object lesson on the value of wired-glass windows in steel sashes and automatic sprinkler protection was presented by the 2-story brick-joisted Montgomery Ward & Co. building. The rear of this structure was also directly across the 30-ft. alley from the fire and adjacent to the Dallam furniture store. Both buildings were subject to identical heat and flame exposure, but whereas flames went through the plain glass windows and ignited the interior of the furniture store, they could not penetrate the wire-glass windows in Montgomery Ward's Heat was so intense that 25 sprinklers operated within the building. The management credits the wired glass and sprinklers with preventing ignition and destruction of the premises.

August 29, near Fresno, Calif. Warehouse—Liquor. $4,000,000.

Preliminary information on this large loss fire, which destroyed the U. S. bonded liquor warehouse near Fresno, was published in the October, 1946, QUARTERLY. Subsequent data received on this loss, however, indicates a number of errors in the original story.

This aerial view of the $4,000,000 liquor warehouse fire near Fresno, Calif., on Aug. 29, shows how the incendiary fire swept the large area property, lacking adequate fire division walls.

The property involved in the fire consisted of a group of one-story brick (24-in. thick, double wall with 8-in. hollow space in center), unsprinklered warehouse buildings with earth and wood floors and composition on wood sheathing roofs, exposed by a group of frame, unsprinklered cotton sheds. The facilities were located on U. S. Highway 99, about one mile south of the city limits of Fresno. Private fire protection consisted of a concrete reservoir with a capacity of 1,500,000 gallons, 2 independent, 750-gpm, electric-driven standard fire pumps, and a looped 6-in. main with hydrants spaced 200 ft. apart completely surrounding the plant. The domestic water supply (30,000-gal. tank on a 62-ft. steel tower) was entirely independent from the fire protection system, although it did serve a number of 2-in. inside hose connections throughout the cotton shed and compress buildings. The electric domestic pump which filled the elevated tank from a deep well was so designed that it would be automatically cut out when the fire pumps operated.

The fire was started by a 14-year-old boy, who admitted setting this as well as a series of other incendiary fires along the Pacific Coast. Until this confession was made it was difficult to understand the fire, which started under the raised floor of a frame cotton shed in an area clear of storage, rubbish, grass or weeds. The frame building immediately adjoined the north fire wall of the bonded warehouse and the fire communicated along an alcohol "trail" which escaped from a small floor level vent in the bottling section of the plant. When discovered by workmen, the fire was well advanced, but 2 inside hose connections from the domestic system were used effectively to control the fire under the raised floor of the cotton shed. When the main fire pumps were started, 2½-in. hose lines were brought into the cotton shed and this part of the fire etxinguished. The liquor warehouse, however, became a raging inferno with intermittent explosions, especially among the stored barrels of brandy. The building was 61,525 sq. ft. in area without fire division walls and some reports place the storage at 1,300,000 gallons of brandies and wines, chiefly owned by Schenley, Hiram Walker and Italian Swiss Colony Wineries.

The two 750-gpm pumps could only deliver the equivalent of 6 standard hose streams. On a fire of this type, manual fire fighting with such protection was obviously heavily handicapped. The photograph shows that the weak streams could not reach the heart of the fire.

Aug. 29, Herlong, Calif. Ordnance Depot. $400,000.

An explosion involved a pile of 14,000 oxygen cylinders at the Sierra Ordnance Depot and resulted in a violent fire. It is assumed that a leaky valve was responsible for the first blast. The depot fire brigade laid 8 hose lines and confined the fire damage to the cylinders, several of which were hurled as far as 500 ft., 3 being blown through a warehouse.

Sept. 5, near Elko, Nev. Airplane Crash. Over $250,000.

This aircraft accident, involving fire immediately upon ground contact, was described in the October, 1946, QUARTERLY, page 134.

Sept. 7, Brooklyn, N. Y. Brewery Warehouse. $550,000.

The 6-story, brick-joisted, 60-year-old, unsprinklered warehouse of Liebmann Breweries, Inc., was destroyed by a fire that originated near the center of the third floor, probably from defective wiring. After discovery at 7:20 P.M. by an employee, flames spread with great rapidity through all 6 floors, stacked with beer cases, and burst through the roof, which collapsed at 10:00 P.M. Flames also extended to the 2-story brewery office building in the same block. Firemen were successful, however, in preventing ignition of the nearby kiln building in which 25,000 gallons of fuel oil were stored.

Sept. 9, Paris, Ill. Grain Elevator. $1,750,000.

Fire, discovered at 11:45 P.M. in the basement of the sprinkler-protected corn mill of the Illinois Cereal Mills Co., was out of control when the public fire department arrived 10 minutes later. The plant consisted of a frame, ironclad elevator, several adjoining and communicating, mixed brick and frame, ironclad sections (comprising the mill-warehouse group) many small wooden sheds, an office building, power plant and a 65,000-gal. wooden water tank. Approximately 85 per cent of the property was provided with a dry pipe sprinkler system supplied by the water tank (elevated 85 ft.), with a secondary source of water from a moderately deficient public source. Insurance authorities rated the sprinkler protection as "fair" because of this weak secondary source.

Acme.

The 60-year-old unsprinklered warehouse of Liebmann's Breweries in Brooklyn, N. Y., was destroyed on Sept. 7.

The sprinklered Illinois Cereal Mills Company corn mill at Paris, Ill., was destroyed on September 9. Failure of sprinklers to control the blaze is attributed to a partially closed valve.

When smoke was noticed coming through a belt hole by employees working on the first floor, investigation showed fire in the north part of the basement near several elevator boots. The alarm was given as employees returned to fight the fire with a small hose. The flames and heat were so intense, however, that they were forced to leave the basement. The foreman recalled seeing water coming from only one head in the fire area, and this without much force. The Paris Fire Department responded with 2 pumpers and 7 men, later supplemented by 8 volunteers and one pumper with 6 men from Terre Haute. Firemen were successful only in saving the exposed power plant and office building, the mill-warehouse group and elevator (including 80,000 bushels of corn) being destroyed. At the height of the fire the wooden water tank burst into flames.

It is thought possible that friction between a pulley and a boot caused the fire. Failure of the sprinklers to operate in the basement and control the fire in its incipiency is blamed on either a partially closed control valve or an inoperative dry pipe valve. The water tank had been full the day of the fire so there was no doubt about there being an adequate primary water supply. Sprinklers in the adjoining buildings apparently operated satisfactorily when flames spread through the unprotected openings. The fire even went beyond control of the sprinklers in these structures because of the magnitude of the exposure fire and the steadily decreasing water supply occasioned by the simultaneous opening of so many sprinkler heads. Hose streams further depleted the water supply available to the sprinklers after the water tank collapsed.

Sept. 11, Fort Lauderdale, Fla. Feed Warehouse. $354,000.

A passing truck driver noticed fire in the large feed warehouse of the Broward Grain Company at 2:00 A.M. Closed and locked 8 hours before, this large, undivided, one-story building, lacking both watchman and automatic protection, presented ample opportunity for a fire to grow to serious proportions before detection. Flames were first noticed in the southwest corner of the building, rented to a building supply firm for storage purposes. When the fire department arrived with one pumper, the fire was still in this area and had not as yet attacked the sacked grain. Water was not taken from the only available hydrant on a 6-in. dead-end main (500 ft. from the fire) because of lower pressure but, instead, from a nearby well which supplied 2 good streams. These lines were later supplemented by one 60-section line laid from a quarry by the Naval Station fire crew which had responded upon request with 2 pumpers. The 3 lines were of limited value by the time they were placed in service, however, as flames had reached the sacked grain and involved the entire single-area building. The concrete block walls could not withstand the severity of the fire within and the building was completely destroyed.

Sept. 12, Washington, D. C. Aircraft. $460,000.

A power plant fire in flight was experienced by the crew of a Douglas C-54 airplane while on a training flight for the Pennsylvania Central Airlines. First notification of the fire came from the warning light on the panel in the cockpit and the flames were readily visible from the cockpit window. The emergency procedures were followed and the installed carbon dioxide system activated. The fire died down momentarily, but then flared up again and the pilot radioed for an emergency landing. On the final approach the oil tank dropped out and as the four-engine ship made contact with the ground the affected power plant was observed to fall free to the runway. The plane was brought to a normal stop and the crew shut off the three remaining engines and made hasty exits to the ground. The wing, in the meantime, continued to burn, fed by fuel from the integral wing tanks. Flames, driven toward the fuselage by the wind, soon burned through the thin duralumin skin and destroyed the entire forward part. Fire-fighting efforts were totally unsuccessful. Analysis of the fire indicated that it was caused by a split in one of the cylinder heads caused by failure of an exhaust valve. Oil was ignited by the backing out of the exhaust pipe and the fire traveled downward with the slip stream providing a blow torch action. Several oil, hydraulic, and fuel lines were burned off, thus intensifying the fire and eventually melting off the engine mounts.

Sept. 15, Estevan, Sask. Aircraft. Over $250,000.

Twenty-one Royal Canadian Air Force men died from multiple body injuries and burns when a Douglas Dakota (C-47A) crashed at the airport while circling for a landing. No airport fire equipment was available and the dispatcher called the city fire department for assistance. Ten minutes passed before fire fighters reached the scene after a 5-mile run. There was little that could be done then and all aboard lost their lives.

Sept. 18, near Gander, Nfld. Aircraft. $460,000.

The ceiling was 500 ft. when the Sabena Airliner sought a landing at the Gander Air-

port after a flight across the ocean from Brussels. The four-engine transport (Douglas DC-4), with thirty-seven passengers and a crew of seven fell short of the airport by twenty-two miles and crashed into the wilderness. Fire was practically instantaneous with the impact, but, in the few seconds which meant life or death, eighteen managed to escape, one of whom died later in a hospital from the injuries sustained. For four days the little band of survivors drank boiled swamp water until helicopters reached the scene to bring them back to civilization and medical care. The twenty-six victims of the impact and fire who died in the wilderness were buried there. This crash, like others before and since, was laid to adverse weather conditions and poor visibility. Since the accident, ground controlled approach radar installations have been installed at this busy international base to aid in preventing a similar tragedy.

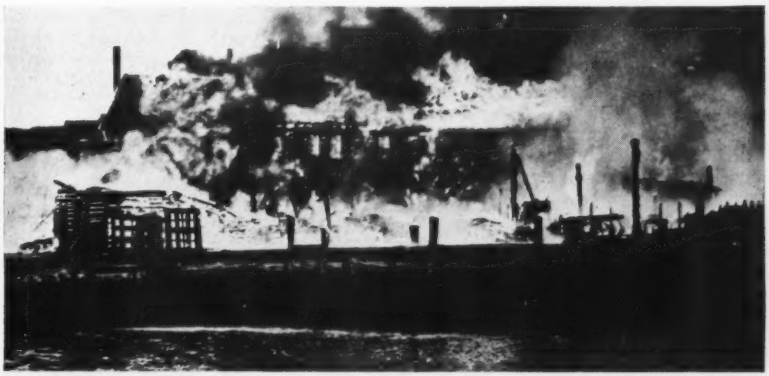
Sept. 18, Galveston, Tex. Warehouse—Cotton. $540,000.

An unsprinklered, shipside, cotton storage warehouse of frame construction was totally destroyed at the Galveston Wharves, together with an estimated 3,500 bales of cotton. The fire, of unknown cause, was first observed by a watchman at 2:10 P.M., but, because of a strike of seamen at the port, it is believed that the fire went undetected for a considerable period prior to the alarm. The pier was in poor condition and responding fire apparatus could not be driven on to the apron for fear of collapse. This required long hose lines from the public mains for land pumpers. Two fireboats and three harbor tugs aided in extinguishment operations. A fire division wall dividing the cotton warehouse from a second storage building on the pier materially aided in preventing a total loss to the superstructure. The cotton alone was valued at $440,000.

Sept. 20, Cloquet, Minn. Insulating Material Mfg. $583,000.

Flames, originating at a machine on the first floor of a wood insulating material manufacturing plant, flashed through the dust collection duct to the roof. During the interval required for water to reach the heads of a dry pipe system (not equipped with quick-opening devices), a fire developed which was too large to be controlled by the installed system. Occupied by the Wood Conversion Co. the frame building was used for the manufacture of insulating material (not flameproofed), and a research laboratory. On the night of the fire 9 employees were at work on the first floor. A plugged feeder caused the belts to slip and generate enough heat to ignite the wood fibers in the bottom of the belt guard.

Workmen immediately laid two 1½-in. standpipe lines, but left the building in the face of heavy smoke (indicating sprinkler operation) and failure of the lights. A police cruiser sent in the alarm at 1:41 A.M. A large number of heads opened at 1:40 on the second floor, but not before the fire was too large to be controlled by sprinklers. Flames continued to spread to the second and third floors before being checked by 14 hose streams.



Press Association.

An unsprinklered, 2-story, frame garage, several other frame structures and a 500-ft. pier of the Maine Paper Company were destroyed by flames in Bucksport, Me., on September 29. **(See page 238.)**

Sept. 29, Linnton, Calif. Oil Barge and Pier. $278,000.

An explosion of flammable vapors, occurring at 4:02 A.M. in a forward compartment of the oil barge *Pendleton,* destroyed the vessel, its cargo of 50,000 gallons of diesel oil, and resulted in heavy fire damage to the General Petroleum Corporation's loading pier. The source of ignition remains unknown. According to the statement of an employee who was slightly injured by the blast, flames shot from the ventilator on a forward compartment, followed almost immediately by the explosion. Flaming oil, thrown over and under the pier, ignited the deck planking. Seventeen engine companies and 3 fireboats responding from Portland were credited with preventing a major catastrophe by keeping flames from reaching 1,500,000 gals. of petroleum stored near the pier.

Sept. 29, Bucksport, Maine. Group Fire—Industrial. $400,000.

Fire of undetermined cause destroyed a large 2-story frame garage and repair shop and several lesser frame structures located on the 500-ft. pier of the Maine Paper Company. Severe structural damage to the pier itself was also sustained. When flames were discovered at 3:00 P.M. in the garage repair shop, employees used fire extinguishers to fight the blaze, summoning the public fire department only when it became apparent that the flames were spreading beyond control. While 12 trucks were driven from the garage before fire prevented further entry, 3 trucks, new truck tires valued at $4,000, 75,000 ft. of lumber, repair equipment and valuable machinery in storage were lost. A tug without steam up was towed to safety from the burning pier, later returning to assist in fire fighting. When a high wind showered the main street section with sparks the Bucksport Fire Department requested assistance from Bangor. The two departments extinguished several incipient roof fires and were successful in confining fire damage to the pier and its structures despite adverse winds. (Photo page 237.)

Oct. 1, Wallace, N. C. Tobacco Sales Warehouse. $400,000.

A defective flue on a small stove in the office of the Hussey Tobacco Sales Warehouse resulted in fire that destroyed this and the adjacent Blanchard and Farrior Warehouse, both storing large quantities of tobacco. The Hussey building was a one-story, frame metal-clad, tobacco warehouse 412 ft. by 105 ft. The exposed structure was an ordinary brick-joisted building 250 ft. by 100 ft. At 11:10 P.M. a tobacco farmer arrived at the Hussey warehouse with 2 trailers of tobacco. The unloading and weighing had been about half completed when fire was noticed in the office of the frame building. A warehouseman immmediately sounded the town's electric fire alarm, but the flames spread so rapidly through the unsprinklered and undivided structure that volunteer firemen found the building beyond saving. Help was summoned from nearby towns to prevent spread to the adjoining warehouse as well as stores and apartments in the block. Three towns each sent one pumper, but flames were already breaking out in the end of the brick warehouse nearest the Hussey building (separated by only a 2-ft. alley) and before effective hose streams could be brought into action this building, also without sprinklers or fire divisions, was lost. A brisk wind carried sparks to a nearby apartment house, igniting the roof and window casings, but firemen were able to extinguish these incipient fires.

National City, Ill., on October 2 and 3 was the scene of two disastrous fires in general storage warehouses of the North American Cold Storage Division of City Ice and Fuel Company. An aggregate loss of $1,500,000 resulted.

Oct. 2, National City, Ill. Warehouses—Group Fire. $1,500,000.

A group of multiple occupancy public and private cold and dry storage warehouses were destroyed by two fires on October 2 and 3, causing losses to over 300 different concerns storing commodities in the buildings. The fire damage sustained was the result of inferior construction, lack of automatic protection, absence of standard watchman service, and the high combustibility of the contents. The second fire was considered a rekindling of the earlier blaze. Fire fighters from East St. Louis and St. Louis responded with men and equipment as the sweeping fires threatened to engulf the entire warehouse section of the city. Nine high capacity pumpers were massed at the peaks of the two fires and as many as 22 hose lines were

placed in operation in efforts to extinguish the flames. The original stop was made at a brick fire division wall which was continually soaked by protective hose streams. The second fire apparently started 27 hours later in alfalfa meal which was stored against this fire wall, probably due to the radiated heat. Numerous failures of fire doors and fire division walls complicated checking the blaze, but the chief difficulty was the large undivided areas of the buildings, the wood floors and roofs, the unprotected floor openings, and the lack of automatic protection equipment. Low water pressures and the dependence upon mutual aid because of the relatively weak local fire department also delayed prompt control of the fire.

Oct. 2, near Battle Mountain, Nev. Aircraft. Over $250,000.

An Army B-29 Boeing bomber, with a crew of eleven, crashed into the side of Buffalo Mountain, 26 miles from Battle Mountain. The giant aircraft burst into flame immediately upon contact with the ground and all lives were lost. Adverse weather conditions (ceiling 150 ft) and poor visibility were believed responsible for the accident, although the pilot had been in radio contact with nearby Army Air Force fields and had ample altitude at last report. The fire, fed by 4,000 gallons of gasoline, oil, and hydraulic fluids, was so intense that only burned and twisted scraps of metal remained when ranchers reached the scene.

October 3, Wellesley, Mass. Group Manufacturing. $900,000.

A weak water supply and obsolete sprinkler system were the outstanding factors that allowed fire to destroy the 2-story frame Wellesley Woolen Company mill and jump a 15-ft. alley to destroy the similarly constructed factory of the Lenk Manufacturing Company (blow torch manufacturing). Radiant heat was so intense that the frame unsprinklered portion of a shoddy mill in Newton across the 100-ft. wide Charles River was also destroyed.

Discovered by an employee reporting for the day shift at 6:30 A.M., the fire is believed to have been caused by a spark from a picker on the second floor. The fire flashed over the lint-covered ceiling of the card room immediately opening many sprinkler heads. When the fire department arrived following a box alarm, water was coming down through the first floor ceiling. However, the flash fire was soon beyond control of the small amount of water issuing from the old-type sprinkler system (heads spaced 12 ft. apart, piping installed in 1880) and flames quickly involved the entire building. Water was supplied to the sprinklers from a 4-in. dead-end main, supplemented by a 10,000-gal. gravity tank. Three hydrants as well as the sprinkler system of the Lenk Manufacturing Company were also served by this 4-in. main. Shortly after the arrival of firemen, flames leaped across the narrow alley to the Lenk Manufacturing Company. All available help was summoned from surrounding communities, and hose lines were laid for considerable distances both from engines pumping from hydrants and drafting from the Charles River. Fire fighters on the Wellesley side of the river were hampered by their inability to approach the fire except by a single narrow road leading to the mill buildings, access from other directions being barred by the river and swampy terrain. On the Newton bank, fire fighters were meanwhile battling the flames in the 3-story, frame warehouse section of the Cordingley shoddy mill which was ignited by the radiant heat. A sprinklered portion of this plant was saved by a fire division wall separating it from the storage section and through the operation of the interior sprinklers which extinguished incipient fires along the river side. (Photo page 240.)

Oct. 3, near Stephenville, Newfoundland. Aircraft. $460,000.

The worst commercial airline accident in history occurred when the American Overseas Airlines plane crashed into the side of a hill near Stephenville, exploded and burned, carrying 39 persons to their deaths. Flying conditions were good, the ceiling was 4,000 ft. and visibility 10 to 12 miles. The take-off had been normal, there was no indication of engine trouble and the plane would have easily cleared the obstacle if it had had another 10 feet of altitude. The scene of the crash was a bare 8 airline miles from the end of the runway. The heavy load of gasoline exploded and cascaded down the side of the mountain and burned for several hours. Passenger liability losses could reach $257,000 based on the maximum of $8,291 per person under the terms of the Warsaw Convention, to which the United States adheres.

Oct. 3, Marcus Hook, Pa. Refinery—Alkylation Unit. $300,000.

Six company employees and 2 volunteer firemen were burned to death, and more than 100 persons were injured, when explosions and fire destroyed the No. 3 alkylation unit and a fractionating tower of the Sun Oil Company's aviation gasoline cracking plant. Shortly before 6:00 P.M., 2 explosions set the unit afire. Company officials stated that a break in a packing

Obsolete sprinkler systems installed prior to 1896 failed to protect 2 large frame factories in Wellesley, Mass., on October 3. The flames jumped 100 ft. across the Charles River to damage a wool shoddy mill heavily. The plants, virtually surrounded by the river and swamplands, were largely inaccessible to fire fighters responding from 5 communities. (See page 239.)

gland permitted fumes to ignite at a nearby heater. Fire departments from Marcus Hook and Linwood responded at once and were assisting the plant fire brigade in extinguishing the flames with foam and wetting down storage tanks and the fractionating tower when the heat caused the 175-ft. tower to topple. As it fell (7:10 P.M.) the pipes ruptured, allowing petroleum vapors to mix with air and explode. The air was showered with flaming gasoline as men were felled or raced to safety with hair or clothing aflame. Hot chunks of metal showered the area, several piercing a Linwood pumper and setting it afire. Six more explosions occurred during the following 3 hours, by which time the flames were under control.

Oct. 4, Artois, Calif. Grain Warehouse. $350,000.

Located in a town unprotected by a fire department or a water supply for fire fighting, Berlinger Brothers one-story wooden warehouse, filled with 120,000 bags of grain, was an easy prey of fire. At 3:00 P.M. employees discovered what, at the time, was a small blaze in one end of the large undivided structure (200 ft. by 75 ft.) and summoned help from 2 volunteer fire departments 6 and 8 miles away. During the interval required for these crews to assemble and drive to the scene, the fire had grown to such proportions that booster tank water supplies were totally inadequate to cope with the flames and the entire warehouse was destroyed.

Oct. 8, Ithaca Township, N. Y. Student Barracks. $250,000.

Delays before and after discovery, a "dead" hydrant, and low water pressure permitted fire to level 5 partially built, 2-story wooden barracks being rushed to completion at Cornell University. The blaze (cause undetermined) was first noticed at 4:00 A.M. by a laborer working in a building some distance from the barracks. It was 4:07 before he could locate a telephone to send the alarm. Responding with one engine, fire fighters discovered one barracks destroyed and another, 60 feet away, in flames. Any hopes they might have had of saving the remaining structures soon faded when the first hydrant to which the pumper was connected was found to be "dead" (shut off for repairs) and the second, 600 feet up the street, yielded a negligible amount of water (attributed to the low water pressure of the University's private water system).

The watchman assigned by the contractor to patrol this property was reported to have been asleep when the fire apparatus arrived.

Oct. 10, Charlottetown, P. E. I. Waterfront Group Fire. $250,000.

Nine one- and 2-story wooden buildings, unprotected by sprinklers or a watchman and closely spaced along a wharf, were destroyed by an early morning fire that had gained great headway before discovery by a watchman on nearby property. Originating at the head of the wharf in the foundry building, flames rapidly involved the boiler and pattern shops and 3 other buildings of the Bruce Stewart Company, then spread to 2 empty coal sheds and finally to the fertilizer plant at the end of the wharf. With the only access to buildings (a 16-ft. wide passageway down one side of the wharf) denied the firemen because of intense heat and flames, fire fighting was restricted to protecting exposures on shore. Ignition of a wooden partition 5 feet from a blast furnace was suggested as a probable cause.

Oct. 12, near New Castle, Del. Aircraft. $750,000.

A Transcontinental Western Airlines "Constellation" overshot the landing field at their New Castle base, struck and demolished a car on the highway, and came to rest in a farm a half-mile away. The 4-engine plane caught fire immediately but 7 crew members, the total complement aboard, scrambled to safety before being trapped. The weather was decidedly adverse and it is considered probable that the limited visibility was directly responsible for the accident. Fire crews which first reached the burning plane attempted to extinguish the fire with large capacity hose lines, but this technique was unsuccessful. Foam and fog were later used and the fire extinguished without great difficulty.

Oct. 12, near Groveton, Virginia. Aircraft. $460,000.

Two members of the crew were the only ones injured among 26 aboard an Eastern Air Lines plane which crashed in a fog three miles south of Alexandria, Virginia. Despite the fact that the crash was immediately followed by fire, the passengers and crew were able to walk away from the wreckage as the impact had cracked the fuselage open. Parts of the wreckage were thrown over 500 yards from the main portion of the remains. The Penn-Daw Volunteer Fire Department responded to a telephone alarm and used fog and foam on the wreckage. Magnesium parts complicated extinguishment.

Oct. 16, Fall River, Mass. Multiple Occupancy—Industrial. $961,000.

Fire starting in an area inaccessible to weak sprinkler protection, gained considerable headway before flames were detected by outsiders

and the alarm transmitted to the city fire department. The building, a 5-story, granite-walled, heavy plank on timber structure, typical of cotton mills constructed 75 years ago, was occupied largely by textile workers. The top floor, where the fire originated, was tenanted by a wearing apparel manufacturer whose operations required a large area cutting table, 50 in. wide and 100 ft. long. The building was protected by a wet pipe sprinkler system (without alarm service) supplied by a low pressure city main (48 lbs. at grade, 13 lbs. at the highest sprinkler) and a 1,000-gal. manually operated steam pump drafting water from a nearby pond. The owners (Danbury Carroting Co.) provided bi-hourly recorded tours by a combination watchman-fireman, who reported that all was in order during the 6:00 P.M. tour. Shortly before 7:30 he glanced out the boiler room door and saw flames issuing from the fifth floor. He ran around the building to pull the street box and met the fire department coming in the gate. During the previous 20 minutes 3 alarms had been given by outsiders. After some delays occasioned by a locked fire door, dragging a hose up 5 flights, being forced back down again because of smoke, and then relocating the pumper at an unobstructed yard hydrant, water was finally applied to the fire. In the interval, second-alarm apparatus had been summoned and the watchman was starting the steam pump. He reported that the pressure, after holding at 50 lbs. for a few minutes, gradually dropped to zero. The drop in pressure was probably due to the fact that additional pumpers had arrived and most were taking water from the yard hydrants. Pressure in the street main also dropped to such a degree that the 6 pumpers could operate at only 50 per cent of capacity. At no time was any attempt made to pump water into the sprinkler system through the pumper connection at the base of the stair tower. The chief, realizing the critical nature of the water shortage, set up two OCD pumps drafting from the nearby pond and this action is credited with saving much of the property involved. It is presumed that the fire was caused by a cigarette or match carelessly discarded under the large cutting table on the fifth floor. Smoking was tolerated on these premises and housekeeping was poor. Here, feeding on cloth scraps, flames generated enough heat to operate sprinklers overhead, but being shielded by the table, were not reached by the water. As more and more heads opened, water from each decreased to a dribble. The flames then jumped to the ceiling and spread rapidly to the far end of this floor where the sprinkler discharge had been negligible and finally penetrated to the fourth and third floors at this section. Water damage to machinery and stock in unburned areas was heavy.

Press Association.

This sprinklered, 5-story, old style, textile manufacturing plant in Fall River, Mass., was heavily damaged by fire on Oct. 16.

Oct. 22, Deshler, Neb. Broom Factory. $250,000.

Failure to equip an otherwise "fireproof" bleaching room with a fire door, or to protect the plant with sprinklers, permitted fire to destroy the 2-story, hollow tile and brick warehouse and manufacturing building of the Deshler Broom Factory, Inc. Flames, originating in the first floor bleaching room during the night, were discovered burning through the wood door separating the bleaching room from the manufacturing and warehouse area by the plant foreman at 5:00 A.M. Following a 20-minute delay during which the foreman and the engineer (the only persons in the plant) fought the flames with extinguishers, a telephone call for assistance was put through to the fire department. As flames raced through the building feeding on highly combustible bales of broom corn, it was obvious that the structure was doomed and efforts were directed toward protecting the adjoining and communicating paint

shop. This two-story, brick-joisted building separated from the factory by a fire wall (openings protected by fire doors) was undamaged by the fire.

Oct. 23, Danville, Va. Tobacco Processing. $475,000.

Flames of undetermined origin were discovered at 2:30 P.M. in the stemming room of the one-story, unsprinklered, brick-joisted processing plant of the Virginia Tobacco Co. Employees, using 5 extinguishers and a small hose stream, tried to control the fire for about 10 minutes, finally calling the fire department when it was obvious the flames had gained the upper hand. On arrival, firemen made certain that all automatic fire doors in the large stemming room (10 ft. by 50 ft.) were closed and then attempted to confine the flames to this section. The flames soon found the one weakness in this defense, an ordinary wooden door leading to an adjoining section. Fire walls and doors backed up by 6 hose streams limited the damage to these 2 areas containing valuable machinery and thousands of pounds of tobacco.

Oct. 21, St. George, N. B. Paper & Pulp Mill. $250,000.

Three hundred and fifty men at the St. George Paper and Pulp Co., as well as employees of 2 granite plants dependent on it for electric power, were deprived of their livelihood when fire destroyed the main paper mill building housing the electric generator. First discovered on the roof by the watchman at 4:30 A.M., the flames spread with such rapidity that the interior of the 2-story, concrete, wood-joisted building was an inferno when firemen arrived from St. George and Black Harbor to assist the mill department. All hope of saving the mill was abandoned and a pulp shed to which flames had spread through a 50-ft. long conveyor was also destroyed. The 10 hose lines protected other threatened exposures.

Oct 24, Hartland, N. B. Starch Mfg. $300,000.

The only market in the county for off-grade potatoes, the New Brunswick Potato Products Plant, was destroyed by fire that originated in the second floor of the starch drying house and flashed over dry starch dust and through unprotected openings to involve the entire unsprinklered, 2-story, frame dry house in a matter of minutes. The flames quickly jumped to the main, 3-story, frame, unsprinklered starch plant which completely surrounded the starch-drying house. Although employees reported the fire promptly by telephone at 4:00 P.M., the buildings were doomed by the time firemen arrived a few minutes later. By efficient use of water pumped from hydrants and drafted from the nearby St. John river the fire fighters, aided by the absence of wind, were successful in saving all exposures. Cause of the fire was attributed to ignition of starch dust by faulty electric wiring.

Oct. 27, Muncie, Ind. Warehouse. $350,000.

Fire, discovered by employees of the Ball Brothers Company at 6:09 A. M. swept through a one-story cement block shed (48,000-sq.-ft. fire area) used for the storage of packing cartons. It appears that the fire was small when discovered, but when fire equipment arrived it had become a "raging inferno," indicating a delayed alarm. Extension of the flames to an exposed building was fortunately checked by operation of 15 sprinkler heads in the building and 8 hose streams from public and private hydrants poorly spaced on a 10-in. main.

Oct. 27, near Bishop, Calif. Tungsten Mine. $250,000.

The surface buildings of the tungsten mine on Mt. Tom (elevation 11,800 feet), 25 miles from the nearest fire department at Bishop, were destroyed by fire believed caused by a defective water heater in the mine commissary. The fire, starting at 2:00 A.M., had spread beyond control at the time of discovery. The buildings destroyed included the commissary, bunkhouses, the hoist house and the aerial tram terminal.

Oct. 28, Huntsville, Ala. Cotton Warehouse. $250,000.

A new cotton storage compartment was erected adjoining 2 old sprinklered compartments at the Jones Baugh Bonded Warehouse. This addition, 212 ft. by 78 ft., was of hollow concrete block walls with a wood-joisted roof. Two door openings (one in each of the 2 old compartments) were made in the common, parapeted fire division wall with standard fire doors planned to protect these openings. Neither the doors nor the addition to the sprinkler system (which had been ordered) were installed when the fire occurred, although the new addition was being used to store 2,500 bales of cotton. A watchman discovered the fire, believed caused by a "fire-packed" bale recently received from the gin, and immediately telephoned an alarm at 12:45 A.M. The section was completely in flames when the fire department arrived. They did excellent work in preventing fire from communicating through the unprotected door openings into the old com-

partments even after a portion of the fire wall parapet fell, causing collapse of portions of the roof and breaking sprinkler piping in one section. The cement block walls of the new compartment failed completely despite pilaster supports at 20-ft. intervals. The continued assistance of the fire department in subsequent salvage operations is credited with a salvage ratio of approximately 50 per cent of the $400,000 stock of damaged cotton.

Oct. 30, Ogdensburg, N. Y. Group Fire. $300,000.

Shortly before midnight a patrolman discovered smoke issuing from the top of an old, 4-story, brick-joisted, unsprinklered building housing a jewelry and furniture store. Firemen, responding to a box alarm, found the fire had spread through an open elevator shaft and had eaten through the roof. Fanned by a strong wind, flames extended to adjoining, similarly constructed mercantile buildings lacking parapeted fire division walls. Help was called from 5 other small departments within a 20-mile radius, but by the time the fire could be controlled 7 buildings were gutted or badly damaged, 16 families were driven from their homes and 9 mercantile establishments were destroyed or damaged.

Press Association.

An aerial view of the ruins of four buildings in Ogdensburg, N. Y., on Oct. 30.

Oct. 30, Weymouth, Mass. Fertilizer Plant. $500,000.

Fire, starting at mid-afternoon, totally destroyed the sulphuric acid unit of the American Agricultural Chemical Company's North Weymouth plant. The building was 320 ft. long and 173 ft. wide, chiefly of frame construction, and ineffectually divided into 2 sections by a 16-in. brick and asbestos-covered fire wall with single fire doors at all openings. Only a favorable wind prevented destruction of the even larger main fertilizer plant buildings nearby. The fire started near the acid vats and it is believed that an employee spilled the acid, resulting in an explosion and fire. The plant fire brigade placed several ineffectual streams in operation from yard hydrants while alarms were sent by telephone and box to the public fire department which responded with 2 pumpers, a squad, and aerial ladder companies. The fire had gained such headway in the unsprinklered building that, while more than a mile away, the chief radioed a third alarm and calls for 2 neighboring departments. At least 15 pieces of apparatus responded and 4 heavy streams were eventually developed despite a totally inadequate water supply from a very old 10-in. main.

Acme.

This 51,000-sq. ft., one-story frame, metal-clad fruit canning plant of the Bordo Products Company was swept by fire on October 31 in Winter Haven, Fla.

Oct. 31, near Winter Haven, Fla. Fruit Canning Plant. $275,000.

Fire, starting from a backfire occurring when an employee attempted to relight an acetylene torch, swept through the 344 ft. by 150 ft. unsprinklered fruit canning and juice plant building of the Bordo Products Company one mile outside the city limits of Winter Haven. The building group, comprising a single fire area of over 50,000 sq. ft., was mostly one story with frame and metal-clad walls on a metal frame. The juice plant proper was 2 and 3 stories in height with concrete on unprotected metal walls, unprotected floor openings and frame

mezzanine floors. Frame-slatted fruit storage bins equal to 3 stories in height adjoined the plant. When the fire occurred the welder was cutting sheet metal near the frame fruit bins. After 15 to 20 minutes delay during which employees attempted to aid the welder whose clothing was ignited, an alarm was telephoned to the fire department which responded immediately to this out-of-city call with one pumper. By the time fire fighters arrived the flames involved practically all of the fruit bin and had spread to the adjoining warehouse. The pumper connected to a hydrant on a dead-end 6-in. main and a call was sent for help. When a second pumper connected to another hydrant on the same main, streams were rendered ineffective and lines had to be disconnected and laid to a lake some 1,300 ft. away. During the interval it became apparent that the fire was spreading beyond control and almost a total loss was sustained. Only rain and a favorable wind prevented spread to a frame packing house and a warehouse which were seriously exposed. Three additional fire departments responding to calls for assistance from other communities could do little because of lack of water. The welder died of his burns in the hospital several hours after the fire started so no details of the cause of the back-fire of the torch could be learned. Insurance loss, including business interruption, may reach $1,000,000.

Press Association.

Flames traveled from the basement of the Rimmon Block in Manchester, N. H., on November 2 to the upper floors through unstopped partitions while employees unsuccessfully fought the fire without calling the fire department.

Oct. 31, Ahoskie, N. C. Grocery Warehouse. $250,000.

An employee of a nearby warehouse discovered fire in the Barnes-Sawyer Grocery Company storage facility and telephoned an alarm at 11:20 P.M. The fire originated in the paint storage section on the top floor of the 3-story, brick-joisted, unsprinklered warehouse lacking protection at vertical openings. The part-paid fire department responded with 2 pumpers and 2 hose trucks and found that the fire was beyond control. Despite inadequate water supplies from a 6-in. dead-end main, 4 hose streams were able to check the spread of flames across a second floor frame passageway to another 2-story warehouse. This stop was all the more remarkable since a fire door to this passageway did not close. Upper floors were overloaded and the fire-weakened joists collapsed, causing the exterior walls to fall. The fire chief reported that the stock was so congested that even the windows were blocked and this fact was another element in the delayed discovery.

Oct. 31, Union Bay, Alaska. Group Fire—Industrial. $400,000.

Fire originated in an electric generating plant of the Alaskan Communications System, presumably under U. S. Army supervision, located on the premises of the Nahat Packing Company near Ketchikan. The fire caused an estimated 90 per cent loss to the packing plant. Property destroyed included cold storage plant, bunk houses, salmon canning plant, commissary, and trap and seine gear, and a number of skiffs. Some estimates place the loss as high as $850,000.

Nov. 2, Manchester, N. H. Multiple Occupancy —Mercantile. $454,000.

Fire, starting in the basement stock room of an automotive supply store in the Rimmon Block, was fought by employees until they were driven out. The first alarm was given by a passer-by who pulled a street box at 12:48 P.M., as flames spread upward through partitions to the first floor and thence upward to the roof. This 420-ft., 4-story, brick-joisted building had stores on the first floor, 30 offices on the second floor, and apartments housing 120 persons on the 2 upper floors. A party wall was intended to divide the block into 2 fire areas, but fire doors on order had not been installed. Thirty-three heavy hose streams were successful in keeping the fire out of the north half of the block except at the roof level. Spectacular rescue efforts by fire department ladder crews saved several endangered occupants of upper floors.

Nov. 5, Bristol, R. I. Rubber Warehouse. $250,000.

A mid-afternoon fire swept through 2 large area combustible storage buildings housing manufactured rubber goods. The local volunteer department consisting of 5 companies responded and aid was summoned from other communities, but these waterfront buildings, once part of a boatyard, were quickly destroyed.

Acme.

Two warehouses of the Bristol Manufacturing Company plant in Bristol, R. I., were destroyed by fire on November 5.

Nov. 10, Chalmette, La. Wharf. $1,000,000.

About 2:45 P.M. on a Sunday, fire of undetermined origin broke out under the wharf of the American Sugar Refining Company located on the river side of a Mississippi River levee. Flames quickly destroyed the wharf, all equipment, structures, and raw sugar stored thereon, and 5 conveyor galleries and passageways leading to 3 fire-resistive sugar warehouses across the levee. The wharf itself was 78 ft. wide and 1,000 ft. long, constructed of plank decking supported on creosoted timber substructure. A corrugated iron on unprotected steel frame warehouse, 60 by 640 ft., was located on the shore side of the wharf.

A watchman, discovering smoke coming through the wood decking, pulled a fire alarm box and attempted to apply a hose stream, but was forced to retire as flames, driven by a strong off-water wind, raced through the creosoted substructure and ignited over a million pounds of raw sugar in burlap bags stored on the wharf. The local volunteer fire department responded with one pumper, augmented later by 15 pumpers, 4 fireboats and 3 ladder trucks from nearby New Orleans. About 20 lines of hose were laid before the wharf structure collapsed into the river and ruptured the suction line supplying all hose lines through the plant fire pumps.

The Salem (Oregon) Nut Growers Cooperative plant and a 700-ton crop of walnuts and filberts were destroyed by fire on November 12. The fire originated in the frame building at the left and spread to the adjoining metal-clad warehouse.

Press Association.

Fire of suspicious origin destroyed the prefabricated housing unit plant of the Red-E-Bilt Company in Oakland, Calif., on November 13.

Nov. 11, Chanute, Kansas. Dress Factory. $315,000.

Nearly 10,000 women's dresses were destroyed, together with a large stock of cotton and rayon goods, when fire of undetermined origin razed the property of the Mode O'Day Corp. The factory was an unprotected, 2-story, brick structure with wood floors housing the usual cutting and sewing machines common to the occupancy. The fire started on the first floor during the night and was well established when discovered by a passer-by shortly before 3:00 A.M. By the time the fire department arrived in response to a telephone alarm, flames were bursting from the windows at one corner of the building and the fire was spreading rapidly over the cutting tables. The firemen placed 5 hose lines in operation and after about 30 minutes believed they had the fire under control. Then a 55-gal. drum of sewing machine oil and a barrel containing about 25 gals. of kerosene ruptured, spreading the fire to the elevator shafts. The second floor, where thousands of finished dresses were hanging on racks, was soon involved and all chance of saving the building or contents was ended.

Nov. 12, Salem, Oregon. Nut Processing & Storage. $450,000.

Most of a 700-ton crop of walnuts and filberts were destroyed by fire that originated in the bleaching and grading section of the Salem Nut Growers Cooperative plant. While the cause of the fire is uncertain it has been suggested that it was due either to an overheated duct or to spontaneous ignition resulting from the extensive use of 35 per cent concentrated hydrogen peroxide for bleaching purposes. It is evident that 24 carboys of this chemical stored in the property markedly contributed to the rapid spread of the flames. The property involved consisted of a 3-story frame building with an adjoining warehouse of corrugated iron construction. Except for the watchman who discovered the fire on the third floor shortly after 8:00 P.M., there was no private fire protection. Stairways were unprotected and adequate cut-offs between areas lacking. The large loss may be attributed in part to the high value of the nuts, appraised at $425 per ton.

Nov. 13, near Burbank, Calif. Aircraft. Over $250,000.

During a heavy snow storm, a Western Air Lines transport plane crashed on White Mountain, carrying all 11 passengers and crew members to their deaths. The victims were burned beyond identification and the fuselage gutted. Air line officials estimated the plane carried over 300 gallons of gasoline at the time of the accident.

Nov. 13, Oakland, Calif. Woodworker. $269,000.

Fire of suspicious origin destroyed the frame, metal-clad building used for the manufacture of prefabricated housing units by the Red-E-Bilt Co. The fire started shortly after midnight and had gained great headway before it was discovered. The 400-ft. building had once been occupied as a machine shop and the oil-soaked flooring as well as the combustible contents contributed to the rapid spread of the

International News.

The historic Knox-Crescent Presbyterian Church in Montreal was gutted by fire of unknown cause on Nov. 14. **(See page 248.)**

Acme.

A propane gas explosion followed by fire killed 6 persons and caused this wreckage of the Ideal Laundry in Greenville, S. C., on Nov. 19. The gas escaped from connections to a 6,000-gal. propane tank recently installed in an open courtyard and ignited from an unknown source.

flames throughout the large single fire area. The entire interior was involved when the fire department arrived on the scene.

Nov. 14, Montreal, P. Q. Church. $300,000.

Fire of unknown origin gutted the historic Knox-Crescent Presbyterian Church, a Montreal landmark for more than 60 years. The fire was discovered shortly before midnight by the caretaker. It spread rapidly from its point of origin in or near the kitchen to involve the entire stone and wood structure. (Photo page 247.)

Nov. 19, Kansas City, Mo. Metalworker. $250,000.

Heavy damage resulted from a fire which occurred when a 2-in. high pressure oil line broke and allowed the liquid to come in contact with molten aluminum at the Rupert Diecasting Co. The fire mushroomed against the wood roof of the single-story, brick building covering a full city block and spread throughout the diecasting department. Valuable machinery was heavily damaged and the roof collapsed. Fire walls confined damage to about 15,000 sq. ft. of the 80,000-sq.-ft. building.

Nov. 19, Greenville, S. C. Laundry. $1,250,000.

Six people were killed and 150 injured when a propane gas explosion wrecked the Ideal Laundry and damaged neighboring buildings. A 6,000-gal. propane tank had recently been installed in the laundry yard to supply boilers. An employee discovered a propane leak at about 6:00 P.M. and notified the manager who ordered the building evacuated and called the fire department. An attempt was made to shut off the flow of gas, but the valve at the tank could not be closed and employees fled. The explosion occurred at 6:27 P.M. from some undetermined source of ignition. The laundry

Press Association.

Fire at the Rupert Diecasting Company in Kansas City, Mo., on November 19.

building was demolished and nearly all buildings within 300 feet were damaged. Windows a mile away were broken and chimneys weakened. Fire in the laundry wreckage and in 3 nearby dwellings followed the explosion. The fire department prevented spread of flames, but for some time afterwards further fires occurred in dwellings because of damaged chimneys. Fire Chief Donnald reports that the explosion was probably due to a break in a 2-in. propane pipe caused by vibration. The vaporizer and the reducing valve, found undamaged after the fire, were apparently not responsible.

Press Association.

The Lehman Company furniture factory in Cannelton, Ind., on November 24. Only outside aid saved the city from a major conflagration as the local fire department had only a hose cart.

Nov. 24, Cannelton, Ind. Furniture Factory. $732,000.

Fire, originating in a small unsprinklered addition to a 2-story, sprinklered, metal-clad, frame warehouse, spread over the roof of the latter structure, and from there throughout the entire sprinklered furniture factory of the Lehman Co. of America, Inc. From the small unprotected addition, the spread of flames was chiefly over the roof and thus above the effective range of the automatic sprinklers. The fire quickly reached such proportions that the sprinkler system was overpowered because of the large number of heads which opened and the weak water supply which was limited to a 50,000-gal. elevated tank and a 6-in. public water main. The fire was discovered shortly before 5 o'clock on a Sunday afternoon by a passer-by who notified the plant engineer. The local volunteer fire department, having no pumper, responded with a hose cart. Fire apparatus from 3 surrounding towns responded to appeals for help as the fire raged unchecked before a 25 to 30 mph wind. The gravity tank was soon depleted by the additional demand of multiple hose streams and all available water from the 6-in. main was being utilized. Excessive amounts of finishing materials at scattered locations in the plant contributed to the intensity and spread of the fire. Just when the fire was thought to be under control after nearly 2 hours of fire fighting, the chief of the Tell City Fire Department suffered fatal injuries and fire fighting was disrupted, allowing the fire to spread to other buildings. Fire fighters were also hampered by the bursting of several lengths of "emergency" single-jacketed hose. An attempt to draft water from the Ohio River nearly ½ mile distant was defeated because of insufficient hose. When it appeared that a conflagration might develop, the Evansville (Ind.) Fire Department was called. They responded with 2 pumpers at 8:30 P.M. and immediately drafted water from the Ohio River. Using one pumper as a booster, 2 good hose streams were secured and were instrumental in preventing a conflagration. By 11:00 P.M. the fire had burned itself out with a total loss except for some lumber storage in the yard. Property damage was placed at $507,000, with business interruption at $225,000 (total insurance coverage).

Nov. 26, Lafayette, Ind. Warehouse—Terminal. $295,000.

Flames were discovered by a passer-by at 11:25 P.M., breaking through the roof of the New York Central Railroad freight terminal filled to overflowing with freight. It was obvious when firemen reached the scene that the 50-year-old, unsprinklered plank and timber warehouse (350 ft. by 50 ft.), was doomed. All available apparatus was rushed to the scene, however, to protect the nearby business district being showered by wind-driven sparks. Insurance loss may run to the $400,000 mark, but destruction of records has slowed settlement of claims on the contents.

Nov. 29, Charlottetown, P. E. I. Meat Processing Plant. $500,000.

The plant engineer of Davis & Frazer, Ltd., was killed by suffocation while attempting to close a fire door segregating the smoke house from an adjoining section of the 2-story, brick-joisted, unsprinklered meat processing plant. Shortly before 6:00 A.M. the watchman piled wood on the smoke house stove. Flames from the overheated stove flashed over the greasy deposit in the smoke room and quickly reached tons of pork products on the second floor via an open elevator shaft. The watchman in the meantime, after an unsuccessful attempt to manipulate the plant switchboard, called the fire department by using an outside telephone. (Charlottetown has no fire alarm system).

The Veterans' Hospital at Peterboro, Ont., lacking automatic protection, was totally destroyed by fire on December 6.

When the fire department arrived flames had spread past the open non-automatic fire door (it was in attempting to close this door that the engineer lost his life) and had involved the second of the 3 fire areas into which the plant was divided. An inadequate water supply from the 4-in. main hampered the fire fighters at the outset, but additional supplies were secured when 2 pumpers took draft from a pond 375 ft. from the fire.

Nov. 29, Dallas Texas. Department Store. $925,000.

A fire which did not spread beyond an inaccessible 700-sq.-ft. area in the basement of the 4-and 5-story, fire-resistive Neiman-Marcus department store, caused severe smoke and heat damage to heavily stocked merchandise in the basement and extensive smoke damage to merchandise on the first floor. Lesser damage was suffered on upper floors, but smoke reached all parts of the building through the air-conditioning system.

Window decorators on the first floor, alerted by smoke coming from an air-conditioning grill, telephoned the alarm at 11:57 P.M.

The fire was traced to the basement, although all was in order when the central station supervised watchman had sent in a signal from this area at 11:23 P.M. Prevented by heat and smoke from entering the area, firemen were further handicapped by stock, stock shelves and partitions from reaching the seat of the fire with hose streams directed from 2 small stairways. Eventually a small floor opening was located some distance from the fire into which 2 distributing nozzles were lowered to cool the area enough for firemen to descend to the basement and extinguish the fire. The all-out was sounded at 3:27 A.M. The exact cause of the fire is undetermined. It is believed that combustible materials near the power switchboard located in an unsprinklered basement area became ignited. Flames then spread to and involved the switchboard. Two adjacent sprinklered areas, separated by masonry walls, were not involved and no heads fused.

Dec. 6, Peterboro, Ont. Veterans' Hospital. $1,500,000.

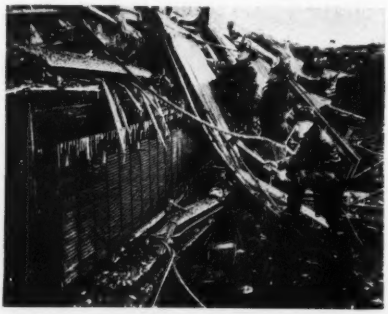
Execution by hospital attendants of a prearranged plan of action was a major factor in the successful evacuation of all 228 patients when fire destroyed the Department of Veterans' Affairs Tubercular Hospital. Shortly after midnight, fire was discovered by an orderly in a basement storage room of the administration building, one of 4 large, 2-story frame structures connected by enclosed ramps and corridors. All patients were marshaled in groups to await the order to evacuate. When the signal came they moved out quietly in a steady line. Cause of the fire has been attributed to a carelessly discarded cigarette. In a matter of minutes flames had enveloped the administration building and were spreading to the other buildings via the unprotected ramp and corridor openings.

Dec. 7, Atlanta, Ga. Hotel. $1,620,000.

Details of the Winecoff Hotel disaster, costing 122 lives, are given in this issue of the QUARTERLY. The loss given above is divided $400,000 for property damage, $1,220,000 for liability for lives lost (at $10,000 per person).

Dec. 8, St. Boniface, Man. Grain Elevators. $500,000.

The fourth serious fire in this city in eleven days destroyed the 200-ft. high metal-clad Red River grain elevator and then spread to and leveled the 4-story frame Grand Prairie elevator 70 yards away. Discovering smoke in the elevator the watchman of the Red River property telephoned the alarm at 2:35 A.M. When



Acme.

Citizens of three communities lacked telephone service after fire destroyed the River Grove, Ill., telephone exchange of the Illinois Bell Telephone Company on December 14.

firemen arrived a few minutes later, they found the elevator a mass of flames and used their 3 hose lines to protect the exposures. The inadequate amount of water supplied at low hydrant pressure was no match for the flames, however, and the second elevator burned to the ground. Firemen were successful in saving 3 annex buildings. Sparks ignited and destroyed a small warehouse, a lunchroom and 750,000 empty grain bags piled on the ground. At least 100,000 bushels of grain in the 2 elevators were destroyed.

Dec. 14, River Grove, Ill. Telephone Exchange. $394,000.

Citizens of 3 communities were left without telephone service when fire destroyed the 2-story, brick-joisted River Grove exchange and business office of the Illinois Bell Telephone Co. Starting in the basement furnace room, unprotected by sprinklers or automatic fire detection equipment, the fire was discovered when a telephone operator smelled smoke at 2:55 A.M. Firemen responded at once, but were hampered by difficulty of access to the basement. The basement fire was being brought under control when it was discovered that fire had traveled up through conduits and non-fire stopped walls to the large undivided attic. Shortly thereafter, the fire-weakened roof fell into the second floor, destroying valuable equipment. It is believed a defective stoker might have started the blaze.

Dec. 16, Smiths Falls, Ont. Apartments and Stores. $250,000.

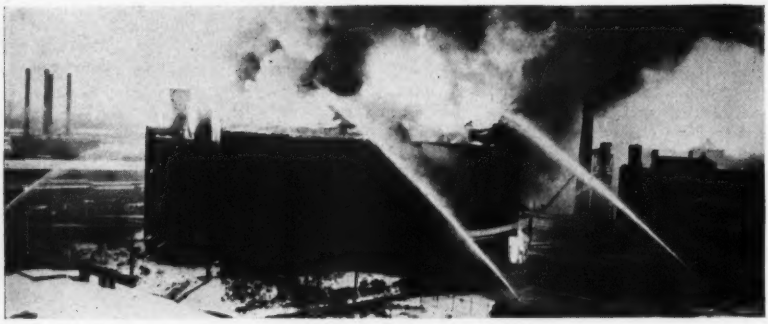
Fire that originated in the kitchen of a candy store at 10:15 A.M. raced with such rapidity upward through partitions and the main stairway of the 3-story, brick-joisted Kerfoot Block that many occupants of the 8 upstairs apartments had difficulty escaping. It is believed that gasoline ignited as it was being poured into the tank of a gasoline stove. The candy store proprietor telephoned the fire department at once and then fought the fire with an extinguisher. Firemen, hampered by dense smoke, summoned help from several surrounding communities. Occupancies of the gutted building included 8 apartments, 5 retail stores and a dentist's office.

Dec. 19, Minneapolis, Minn. Grain Elevator. $2,500,000.

Inadequacy of water supplies for private and public fire protection of this frame metal-clad terminal elevator of the Froedtert Grain and Malting Co., Inc., was a major factor contributing to its destruction by fire. Located in a congested railroad yard not easily accessible to fire fighters, the large elevator was protected by an inadequate dry pipe sprinkler system (obsolete pipe schedule and poor distribution), supplied from a 4500-gal. pressure tank and an automatic 750-gal. fire pump acting as a booster for the low pressure 6-in. dead-end city main (maximum water 500 gpm at zero lbs. pressure). It is believed that friction between a pulley and belt caused the fire that was discovered by an employee at 12:12 A.M. The alarm was sent from a private fire alarm box followed by 3 additional alarms transmitted by fire officials during the next half hour. The inadequate amount of sprinkler water (further depleted when electric power failure stopped the fire

Press Association.

Three million bushels of barley were destroyed in this fire at the 50-year-old Union Grain Elevator in Minneapolis on December 19. The automatic sprinkler equipment was obsolete, water supplies totally inadequate, and the elevator so isolated that fire-fighting activities were hopeless.



Press Association.

The second large grain elevator to be destroyed in Minneapolis within 2 weeks destroyed the Brooks Elevator on December 28, with loss estimated at $1,000,000.

pump at 12:28 A.M.) was no match for the flames that spread rapidly through the 80-ft.-high elevator. The fire was also beyond the control of the fire fighters who directed their efforts toward saving exposures. As soon as freight cars were pulled out of the way, several long lines were laid, some taking water from hydrants a mile from the fire. Serious exposure damage was confined to the adjacent power plant and grain drier building. More than 1,000,000 bushels of grain were destroyed with the elevator.

Dec. 24, Fairbanks, Alaska. Telephone Exchange. $300,000.

Brief newspaper items reported the destruction on Christmas Eve of the central telephone office of the Northern Commercial Co., serving the 8,000 inhabitants of Fairbanks. The company garage was damaged. Further details are not as yet available.

Dec. 28, Minneapolis, Minn. Grain Elevator. $1,846,000.

According to incomplete reports the one-block square, timber and metal-clad unsprinklered terminal elevator of the Brooks Elevator Corp., filled to capacity with 1,000,000 bushels of rye, corn, and barley, was destroyed by fire caused by friction between a pulley and belt. A strong draft carried flames upward through the structure after a dust explosion early in the fire blew off the roof. The loss is estimated $1,260,000 for grain, $296,000 for buildings, and $290,000 use and occupancy.

Dec. 30, North Salem, Ore. Furniture Mfg. $250,000.

Lack of an adequate supply of water for fire fighting permitted flames to destroy the large one-story frame Reimann furniture factory. Fire was discovered in an assembly room near the center of the plant by a night shift employee at 7:25 P.M. Cause of the fire is unknown. The 2 hose lines laid from the only hydrant, 1,000 ft. away, were of use only for protection of exposures, as the fire, feeding on stored furniture, barrels of lacquer, and kiln dried wood, leveled the building in 2 hours.

Regional Distribution.

The Middle Atlantic States of New York, New Jersey and Pennsylvania, the South Atlantic States, Delaware to Florida, and the East North Central States of Ohio, Indiana, Illinois, Michigan, and Wisconsin, each had 28 fires in the large loss class. Washington, Oregon, and California had a total of 27 of the fires, while the West North Central States (from the Dakotas to Missouri and Kansas) had 14 and New England 12. The balance occurring in the United States, 21 in number, are pretty evenly divided over the balance of the country. Canada had 23 of this year's total (compared to 17 in 1945), Alaska 3, and Newfoundland 3.

... when danger threatens

When burglars or bandits attack... when fire strikes... or other dangers threaten... immediate action is the all-important factor in safeguarding lives and property. To insure immediate action protective signaling systems in thousands of commercial and industrial establishments operate through A.D.T. Central Stations to instantly dispatch armed guards, the police, fire department or whatever emergency forces the occasion demands. And, of utmost importance... A.D.T. provides continuous electrical supervision, periodic inspections and tests and complete maintenance, without which there can be no assurance that any protective signaling system will function when an emergency arises. The following A.D.T. Central Station Electric Protection Services are available in all principal municipalities in the United States:

Sprinkler Supervisory and Waterflow Alarm Service · Aero Automatic Fire Alarm Service · Manual Fire Alarm Service Burglar Alarm Service · Holdup Alarm Service · Watchman's Reporting Service.

Controlled Companies of **AMERICAN DISTRICT TELEGRAPH CO.** *155 Sixth Ave., New York 13, N.Y.*
CENTRAL STATION OFFICES IN ALL PRINCIPAL CITIES OF THE U.S.

A·D·T

Electric Protection Services
AGAINST FIRE · BURGLARY · HOLDUP
A NATION-WIDE ORGANIZATION

"Eternal Vigilance"

—THE PRICE OF SECURITY!

WHETHER IT BE NATIONAL OR INDIVIDUAL PERFORMANCE . . . SECURITY IS ACHIEVED ONLY BY THE EVER-ALERT, EVER-CAPABLE AND EVER-DEPENDABLE!

All of these requisites for SECURITY against loss of life and property by fire are provided through the "ETERNAL VIGILANCE" of

STAR AUTOMATIC SPRINKLERS

Automatic Sprinklers
Corrosion-Proof Sprinklers
Directional Flow Sprinklers
Open Sprinklers
Spray Sprinklers
Alarm Devices

Automatic Releases
Standard Wet Pipe Systems
Dry Pipe Systems
Deluge Systems
Heat-Actuated Devices
Pre-Action Systems

Star Automatic Sprinklers and Fire Protection Devices bear approval of all Insurance Authorities having jurisdiction and various Governmental Agencies

Economy in installation cost and maintenance has dictated the consistent policy of Star Sprinkler Corporation in distributing its Fire Protection Devices through local licensed contractors who have had a lifetime of experience in the installation of automatic sprinkler systems. Operating throughout the United States, Canada and South America, Star licensees, due to their strategic locations, can render instant service. Write us for name and address of Star licensed contractor nearest your location.

STAR SPRINKLER CORP.

Westmoreland and Collins Sts. — Philadelphia, Pa.

Eriez

MAGNETIC HUMP

APPROVED BY

ASSOCIATED FACTORY MUTUAL FIRE INSURANCE COMPANIES

184 HIGH STREET, F M BOSTON 10, MASS.

ERIEZ MANUFACTURING COMPANY CO., ERIE, PA. U.S.A.

Adaptors of any length to fit various diameter pipelines optional
2nd Eriez Magnet gives double protection against Tramp Iron
UNCLEAN MATERIAL ENTERS HERE
MATERIAL CLEANED OF TRAMP IRON EXITS HERE
Tramp Iron removed by 1st Eriez Magnet

Eriez Non-Electric Magnetic Humps have been officially approved by Associated Factory Mutual Fire Insurance Companies. They provide effective magnetic protection against tramp iron. Installed in any pneumatic processing lines they effectively remove tramp iron from such materials as fibres, sawdust, cork, starch, and grains and all types of explosive dust. The seal of approval of Associated Factory Mutual (reproduced above) will be placed on each ERIEZ Magnetic Hump that leaves the Eriez Mfg. Co. factory.

When It's Magnetic Protection . . . . . See Eriez First

ERIEZ MANUFACTURING COMPANY

39 East 12th Street · Erie, Pennsylvania

STOP HOTEL FIRES

Save Lives and Property

Install

Central Automatic Sprinklers

Fires extinguish themselves with Central Sprinklers.

No Panic—No Loss of Life.

Central Sprinklers usually pay for themselves from insurance savings.

CENTRAL AUTOMATIC SPRINKLER CO.

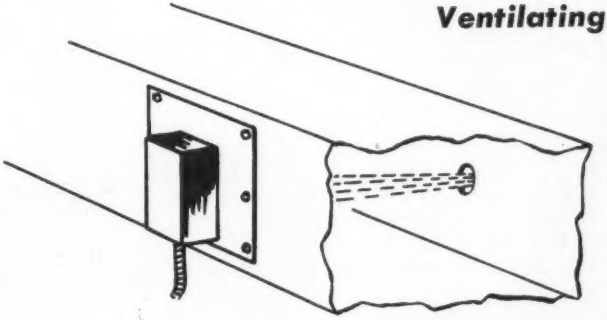
Main Office and Plant: Fourth Street and Cannon Avenue

LANSDALE, PA.

Offices and Licensees in Principal Cities of United States and Canada

VENTILATING FIRE HAZARDS CONTROLLED

By Electronic Smoke Detection in Ventilating Ducts



- Automatically stops ventilating fan when smoke or industrial dusts intercept a light beam.
- Permits operation of ordinary thermal fire control equipment.
- Sounds warning.
- The Worner Fan Motor Stop has been tested by years of application and meets the requirements of the National Board of Fire Underwriters.

Simple to Install — Easy to Maintain

Price $225.00 f.o.b.

**

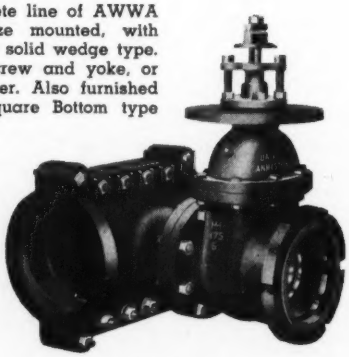
WORNER ELECTRONIC DEVICES

P. O. Box 69, Rankin, Illinois

VALVES
HYDRANTS
AND PIPE LINE ACCESSORIES

M & H furnishes a complete line of AWWA Valves, iron body, bronze mounted, with double-disc parallel seat or solid wedge type. Non-rising stem, outside screw and yoke, or with sliding stem and lever. Also furnished hydraulically operated. Square Bottom type operates in any position.

Post Indicator Valves, Indicator Posts, Check Valves, B & S Fittings



M & H Tapping Sleeve and Valve (illustrated above) is used to tap a main under pressure for the purpose of taking off a branch leading to automatic sprinklers, fire hydrants, etc. By this method the cut-in is made without interrupting the services on the existing water main.

AWWA & UNDERWRITERS APPROVED FIRE HYDRANTS

M & H Fire Hydrants are dry top and revolving head. They are easy to lubricate. Maintenance costs are low due to simplicity of design and rugged construction. They have low friction loss and great efficiency because barrel diameter is not reduced and there are no working parts or obstruction in waterway. Special Traffic model (shown at right) is designed to yield at the ground line under impact. Repair is simple and easy.

M&H VALVE
AND FITTINGS COMPANY
ANNISTON, ALABAMA

FIRETOX

CONSTANT PROTECTION DURING DANGER MONTHS

Recently compiled statistics point out that the most dangerous season for fires is the winter months, when about a quarter of all fires can be traced to faulty heating equipment, stoves, furnaces, chimneys, etc. Your property, however, may be destroyed during one of the other months. Fire knows no holiday and can be checked only by constant vigilance. Where your property is concerned, *every month is a danger month.*

FIRETOX is a self-contained chemically operated fire extinguishing unit which smothers a fire before is can get started. One Firetox unit will protect an area of 700 cubic feet. Firetox is non-toxic, and completely eliminates costly water damage. Firetox can be installed in less than a cubic foot of space and is good indefinitely, protecting your property constantly. Install Firetox and protect your property *every month.*

FIRETOX

"Heart of Gold"

The "Heart of Gold," found in every Firetox unit, is a 24-carat gold diaphragm which assures perfect performance, in keeping with the precision action designed by Firetox engineers. In fire protection, quality cannot be sacrificed. Firetox IS quality protection.

FIRETOX SPECIALISTS . . . are available for consultation throughout the country. Write our Main Office for "specialist" nearest you.

FM

FIRETOX SYSTEM, INC.,

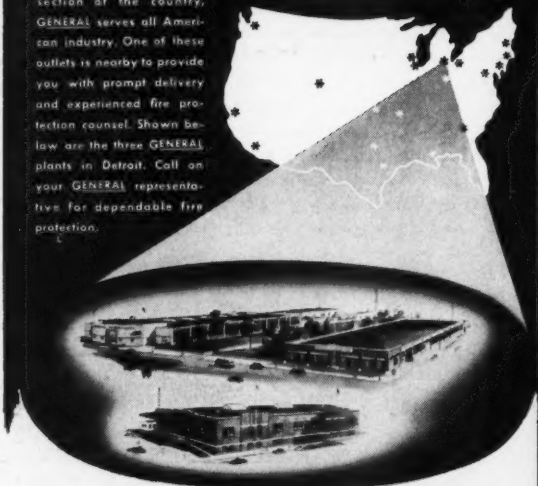
UL

998 Farmington Ave., West Hartford 7, Conn.

NATIONAL SERVICE

20 GENERAL Branches and Warehouses To Serve You...

Through its branch offices and distributors in every section of the country, GENERAL serves all American industry. One of these outlets is nearby to provide you with prompt delivery and experienced fire protection counsel. Shown below are the three GENERAL plants in Detroit. Call on your GENERAL representative for dependable fire protection.



S-O-S Fire Guard

S. O. S. FIRE GUARD Vaporizing Liquid Extinguisher. America's great utility fire fighter. Effective on oil, electrical, grease, and gasoline fires. Will not freeze at 48 below zero. 1 qt. and 1½ qt. sizes.

CO2 SNO FOG

CO2 SNO FOG Carbon Dioxide Extinguisher. Kills fire instantly, yet cannot damage equipment, premises, or personnel. Effective on electrical, oil, and gasoline fires. Sizes 2- to 100 lbs.

Red Star

RED STAR Soda Acid Extinguisher. Releases strong stream of water under chemical pressure. Immediately effective on wood, paper, or textile fires.

THE GENERAL DETROIT CORP.

Manufacturers of Fire Extinguishers, Motor Fire Apparatus and Allied Equipment

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NEW YORK • PHILADELPHIA • ATLANTA • CHICAGO • DALLAS

West Coast Affiliate: The General Pacific Corp.
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Distributors in Principal Cities

IF IT'S GENERAL IT'S DEPENDABLE

Floafome

FLOAFOME Foam Type Extinguisher. Smothers fire under a blanket of foam. 2 gallon size produces 22 gallons of foam. For use on wood, paper, textile, oil, and gasoline fires.

Protector

ALASKAN and PROTECTOR Pump Type Extinguishers. For wood, paper, or textile fires. Range is 45 feet. Non-freeze charge protects at 48 below zero. ALASKAN—2 gallons. PROTECTOR—5 gallons.

Pacemaker

PACEMAKER Knapsack Type Extinguisher. Can be strapped on back and operated from that position. Telescopic pump nozzle leaves both hands free for fighting fire. Ideal for outdoor fires.

Von Duprin MEANS SAFE EXIT!

Von Duprin, the original self-releasing exit device, offers you the surest, safest, quickest means of exit. These devices provide positive exit at all times, even though the doors are locked against entrance from the outside.

Von Duprins are again being made of drop-forged bronze and brass, as well as the malleable iron which served so well during the war. Made in a wide variety of types for both single and double doors, Von Duprin provides the exact device to comply with your recommendation under almost any exit condition.

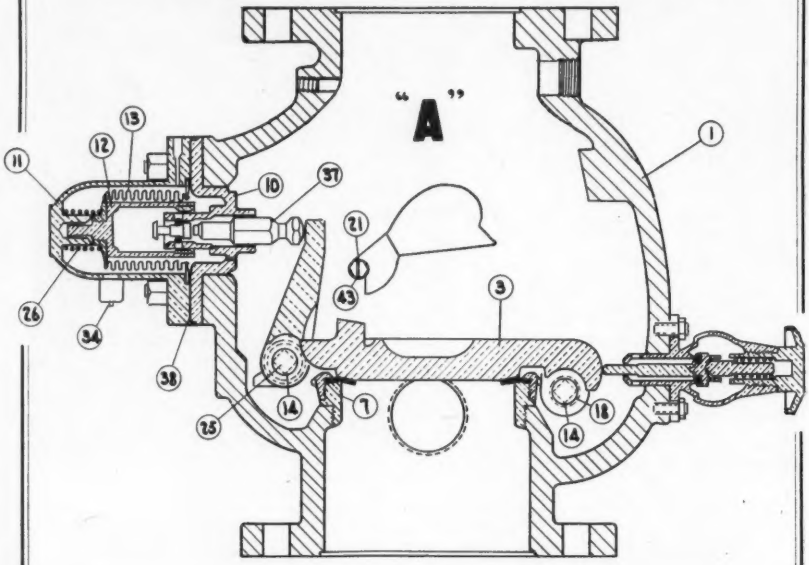
Complete details on request.

VON DUPRIN DIVISION
VONNEGUT HARDWARE CO., INDIANAPOLIS 9, IND.

What's **DIFFERENT** *about Globe Protection*

Globe Model "AD"

The Most Modern of Dry Pipe Valves



DESIGNED SIMPLICITY — BEST FOR SPRINKLER DEVICES

GLOBE

Automatic Sprinkler Co.

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Philadelphia 46, Pa.

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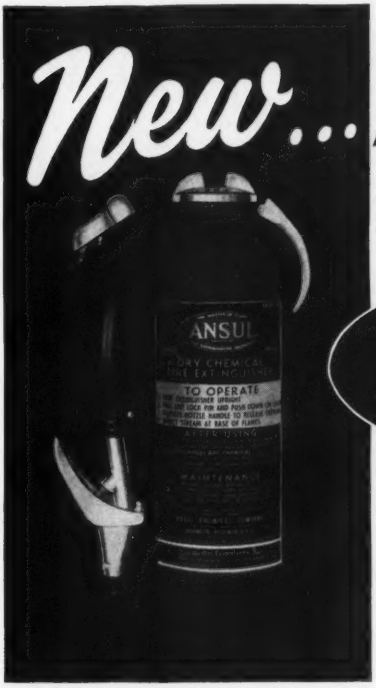


New... FASTER

FIRE STOPPING POWER WITH

THE MASTER OF FLAME
ANSUL*
*REG. U.S. PAT. OFF.
FIRE EXTINGUISHING EQUIPMENT
din Gas

DRY CHEMICAL
FIRE EXTINGUISHERS

- Greatly increased fire-killing capacity.
- Simplified operation.
- Expert performance by inexperienced operators.
- Quick, easier on-the-spot recharge after use.
- More fire stopping power pound for pound, dollar for dollar.
- Greater heat-shielding protection for operator.
- Increased fire-fighting capacity without increased weight.
- Engineered to resist corrosion.

Install the NEW Ansul-Dugas Extinguishers at all hazard spots for greater protection against all fires involving flammable liquids, gases and electrical equipment.

Ready... in a Flash!

Simply remove ring-pin and push lever down.

Open nozzle and direct chemical stream at base of flames.

Listed and Approved by Underwriters' Laboratories and Factory Mutual Laboratories

53% More Fire Stopping Power
with the NEW FASTER ACTING
ANSUL-DUGAS FIRE EXTINGUISHERS

Write today for new catalog and authoritative data showing characteristics of all types of approved hand fire extinguishers.

ANSUL CHEMICAL COMPANY
FIRE EXTINGUISHER DIVISION • MARINETTE, WIS.

LOOK AT THE RECORD MADE BY HOFFMAN

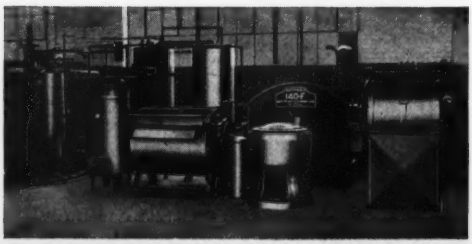
140-F SAFETY DRY CLEANING

LISTED UNDER REEXAMINATION SERVICE UNDERWRITERS' LABORATORIES UL

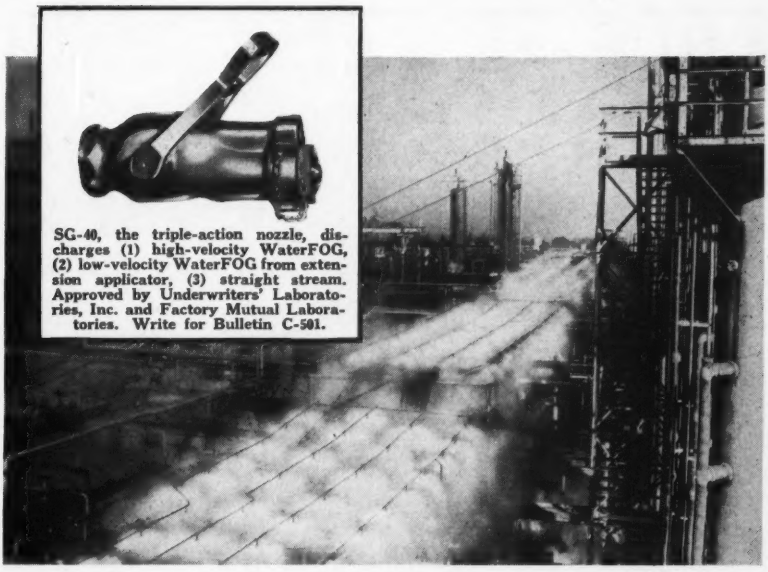
It's a record to be proud of—the clear loss record made by the Hoffman 140-F drycleaning system, in hundreds of installations during the past decade! The point is—this is Petroleum Solvent Equipment—not a chlorinated solvent unit! It's the original Safety Petroleum Solvent Unit—an exclusive U. S. Hoffman development to promote greater safety in the drycleaning industry. An approved Class III system, the 140-F complies with standards of National Board of Fire Underwriters Pamphlet No. 32. Most inspection departments permit installation without enclosing walls.

USES 140° FLASH PETROLEUM SOLVENT

The Hoffman 140-F drycleaning system employs safety solvent with flash-point of approximately 140° F. The system is offered to the drycleaning industry in 12 different types—each one tested and listed by the Underwriters' Laboratories Re-examination Service.



U. S. HOFFMAN MACHINERY CORPORATION
105 Fourth Ave., New York 3, N.Y.
DRY CLEANING · LAUNDRY & GARMENT PRESSING EQUIPMENT



SG-40, the triple-action nozzle, discharges (1) high-velocity WaterFOG, (2) low-velocity WaterFOG from extension applicator, (3) straight stream. Approved by Underwriters' Laboratories, Inc. and Factory Mutual Laboratories. Write for Bulletin C-501.

HOW WATERFOG'S "WET BLANKET" SMOTHERS REFINERY FIRES

Critical areas in oil refineries are the extensive pipe line systems. Fire protection here must be 100% effective—oil fires don't permit second guessing. Fire engineers chose WaterFOG to protect the pipe lines of this refinery because it acts *instantly* . . . smothers oil fires before they can develop headway.

Rockwood's WaterFOG fights fire with atomized water particles many times smaller than spray. These particles quickly blanket the blaze . . . cut off its advance . . . SUFFOCATE it by choking off the oxygen supply. In fixed piping systems and in portable equipment, Rockwood WaterFOG is on the job right now . . . giving maximum protection to scores of oil refineries, industrial plants and municipalities . . . for WaterFOG has proved highly effective on both flammable oil and Class A fires.

Bulletin 123 tells more about WaterFOG's fire-fighting efficiency, and a 16-mm. color film shows WaterFOG in action. They're both yours for the asking—write:

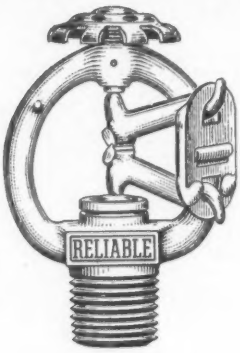
ROCKWOOD SPRINKLER COMPANY, 56 Harlow Street, Worcester 5, Mass. *Specialists in Fire Protection Engineering, Equipment and Installation since 1907.*

Water Engineered by Rockwood Cools, Confines, Smothers Class "A" and Oil Fires

RELIABLE

SUPERFINE

AUTOMATIC SPRINKLER DEVICES



Are excellent in design and construction — have a perfect field record — are universally approved by all Fire Insurance and Governmental Authorities — and effect maximum reductions in fire insurance premiums.

Comprise a complete line including Automatic Sprinklers, Open Sprinklers, Alarm Valves, Dry Pipe Valves, Circuit Closers, Water Motors and all other accessories required in Sprinkler Systems. Other fire protection devices and materials also furnished.

Reliable Sprinkler Equipment now protecting thousands of properties throughout the United States, Canada, and the world.

Write Us For Further Particulars
Manufactured and Distributed by

The Reliable Automatic Sprinkler Co., Inc.

Bronx and Locust Streets • Mount Vernon, N. Y.

On Guard!

STORING AND HANDLING FLAMMABLE LIQUIDS

PROTECTOSEAL

FOR YOUR PROTECTION

get acquainted with the full line of specialized products, each designed for a specific task in safeguarding your property.

SUPPLY CAN

Approved by both U.L. and F.M., provides rapid fire-safe and wasteless way of dispensing all flammable liquids.

SAFETY CAN

U. L. and F. M. approved. Designed for maximum efficiency; greater safety; longer service. Check on the many important, patented features.

BENCH CAN

Minimizes waste and speeds cleaning and swabbing operations. Spring mounted perforated dasher serves as fire baffle. F. M. approved.

OILY WASTE CAN

Developed to meet service requirements vitally important to plant safety and efficiency. A completely new design approved both by U.L. and F.M.

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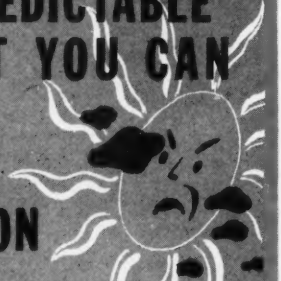
THE PROTECTOSEAL COMPANY

1972 SOUTH WESTERN AVENUE, CHICAGO 8, ILLINOIS

FIRES ARE AS UNPREDICTABLE AS SUN SPOTS.. BUT YOU CAN



plan FIRE PROTECTION

If fires could be forecasted, protection would be simple; the whole fire department could be on the spot, ready to put it out, but fires usually start suddenly, without warning. The first few moments after a fire is discovered are the crucial ones; a proper extinguisher used in time may save thousands of dollars in material and equipment loss and production delay.

Be sure when you check your fire equipment that each type risk is protected; it is dangerous to attempt to put out a fire with the wrong extinguisher—water spreads oil, gas and flammable liquid fires and ruins electric equipment. There is a Pyrene extinguisher for every hazard. Before you need it is the time to install adequate equipment. Let a Pyrene jobber or one of our engineers help you plan a complete protection system. Write today for information.

PYRENE V. L. PUMP TYPE

1 and 1½ quart sizes for homes, automobiles, small trucks and flammable liquids. Non-damaging, safe for electric equipment, handy and easy-to-operate.

PYRENE V. L. PRESSURE TYPE

2 quart and 1 gallon sizes for large trucks, diesel engines, electric equipment and gas, oil and flammable liquid fires. Harmless to generators, motors and wiring.

PYRENE WATER-TYPE

Operated by a gas cartridge. Refill only after use. No danger of acid burns. For protection of ordinary combustibles in stores, offices, factories and public buildings. Also Soda-Acid Type.

PYRENE FOAM EXTINGUISHER

Especially suited to gas, oil, paint and solvent fires. Also Air Foam Playpipes and Systems.

Pyrene

Pyrene Manufacturing Company

NEWARK 8 NEW JERSEY

Affiliated with the C-O-Two Fire Equipment Co.

like having a

FIRE DEPARTMENT

IN YOUR OWN PLANT

INDUSTRIAL SPRINKLER SYSTEMS

Viking Sprinkler Systems go into action with the speed of a Fire Department in your own plant. In peace and war Viking Sprinkler Systems are protecting industrial plants across the nation against the universal enemy of production . . . . FIRE. There is a Viking dealer near you to give you all the facts.

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HASTINGS, MICHIGAN

Draperies that *CANNOT BURN*
protect patrons at the WALDORF-ASTORIA

POWDER ROOM to the STARLIGHT ROOF

Fiberglas fabric in dramatic Tropical Print—chartreuse on grey—has been used for the draperies and lamp shades in this charmingly feminine lounge. The famous *Starlight Roof* and other public rooms in the WALDORF-ASTORIA have achieved new fire-safety through clever use of Fiberglas fabrics in exciting prints and luscious solid colors. *Decorated by W. & J. Sloane, Contract Division, New York.*

FIBERGLAS* Listed by Underwriters' Laboratories, Inc., as "Non-Combustible Fabric;" approved by the Bureau of Standards and Appeals, City of New York.

Permanently fire-safe curtains and draperies—made of Fiberglas*. These decorative, non-combustible fabrics *woven entirely of finely spun glass filaments* eliminate the hazards of temporary flame proofing—*always operate at 100% efficiency.* Immune to rot or decay; will not emit choking fumes if exposed to fire; do not absorb smoke odors.

Fiberglas fabrics are setting new standards of protection and beauty in hotels, restaurants, night clubs and schools. Their unique fire-safety features are equally important to theatres, industrial and public buildings, ships, planes and trains. Endorsed by public safety officials here and abroad; used in all ships of the U. S. Navy (Bur. of Ships Spec. 27c7).

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***Sales representatives or recommended workrooms in:* BOSTON, BUFFALO, CHICAGO, CINCINNATI, CLEVELAND, DETROIT, LOS ANGELES, OAKLAND, PHILADELPHIA, PITTSBURGH, ST. LOUIS, TOLEDO, NEW ORLEANS.**

*T. M. Reg. U. S. Pat. Off. Owens-Corning Fiberglas Corporation

PETROLEUM
MARINE
CHEMICALS
AVIATION
other INDUSTRIES

All fully protected from fire by NATIONAL FOAM

Complete protection given American Business by mechanical (Aer-o-foam) and chemical foams and equipment.

FULL PROTECTION from fire is National Foam System's guarantee to American business and industry. Generations of fire-fighting "know-how" put National Foams and equipment on watchful guard 'round the clock. Specific hazards are met by definite measures—engineered to your particular problems.

National Foams, fire protection specialists, smother flames by thick, tough, enduring foam blankets quickly applied. Threatened areas are insulated; flashbacks are blocked. National Foams stick to angles as well as flowing freely over flat areas, thoroughly sealing off fire-feeding gases.

National Foams and equipment protect dip tanks and spray booths, petroleum installations, marine hazards, chemical plants, planes and hangars—American commerce afloat and ashore. National's engineers diagnose the problem, prescribe complete fire protection.

Write, wire or phone today for what trained technicians can do for you. There is no substitute for fire-fighting experience.

NATIONAL FOAM SYSTEM, INC.
SPECIALIZING IN FOAM FIRE PROTECTION
Packard Building, Philadelphia 2, Pa.

Fire Chief Canvas . . . could have prevented this fire.

An overturned salamander . . . live sparks falling on a canvas tarpaulin . . . the untreated canvas ignites and disaster follows.

With Fire Chief Finished canvas it would have been different. Fire Chief will not support combustion. The canvas may char a little where the spark contacts it, but will not flame, soon goes out.

On all construction work, the few extra cents for Fire Chief Finished Canvas is cheap insurance . . . soon repaid by longer use, for Fire Chief is water, weather, mildew and wear-resistant, too.

Wherever flammable canvas presents a hazard, specify Fire Chief. Approved by both the Underwriters Laboratories and the Associated Factory Mutual Fire Insurance Companies.

WM. E. HOOPER & SONS CO.
New York PHILADELPHIA Chicago
Mills: WOODBERRY, BALTIMORE, MD.

"Fire-Chief" Finished
TRADEMARK
U. S. Patents No. 2,044,176, No. 2,299,612 and other patents

HOOPERWOOD COTTON DUCK

FOR GAS FREEING THAT IS

★ *Safe*

★★ *Fast*

★★★ *Cheap*

Here is the S. & J. STEAM-EX, a high volume vacuum ejector which may be operated by either steam or compressed air, and is widely used in gas freeing petroleum storage tanks prior to interior inspection, cleaning, and repair. With steam at 75# p.s.i. it uses 900 pounds per hour. With compressed air at 100 p.s.i., 200 cu. ft. per minute are required. Under these conditions the STEAM-EX will exhaust 300,000 cu. ft. per hour, sufficient to completely displace a 100,000 barrel tank in less than 2 hours.

You simply install the STEAM-EX over a 20" manhole in the tank top, connect your steam or air hose or piping, open up all bottom manhole covers, and turn on the steam or air to operate the exhauster. Dangerous gases are dissipated to the atmosphere. One of the major oil companies which uses STEAM-EX concludes: "Tank purging by forced ventilation with air can be accomplished with less hazard than where steam is injected into the tank."

Write for a descriptive folder and price on STEAM-EX.

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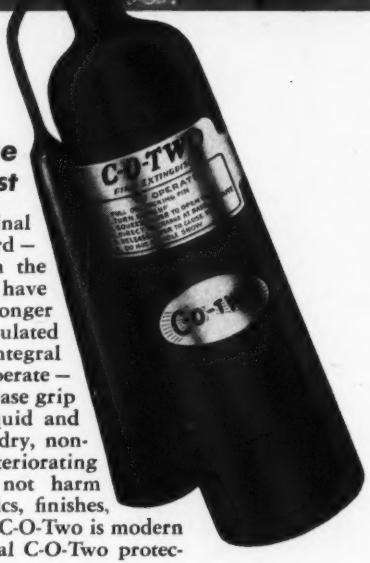
More Fire Fighting Reserve
Less Weight • No Extra Cost



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C-O-Two is our registered trade mark and corporate name. Be safe, specify C-O-Two when ordering.

C-O-Two Fire Equipment Co.

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C-O-TWO

IF you're planning new construction or the remodeling of your existing facilities, adequate defense against fire must receive primary consideration. For the very structure of business enterprise is dependent upon continuity, and *fire can destroy that continuity with deliberate suddenness.*

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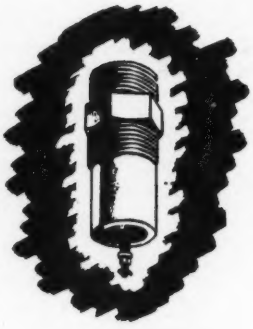

RegO Excess Flow Check Valves

REGO LP GAS EQUIPMENT

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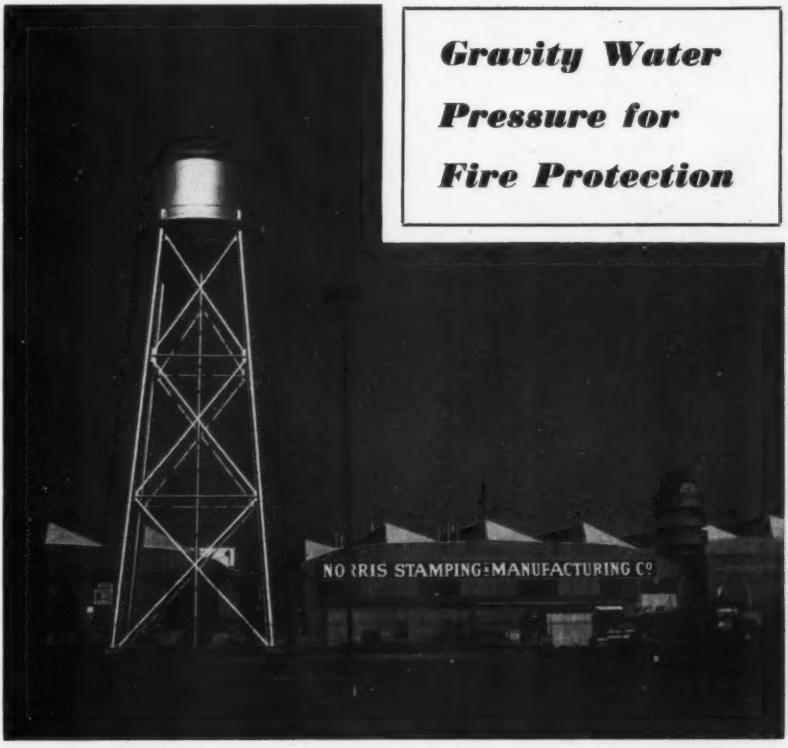

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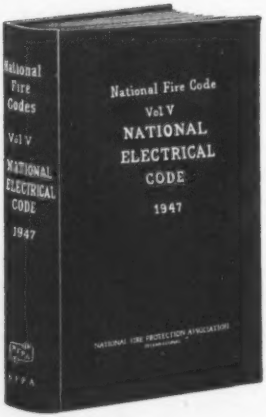

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